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13 SEP 1989

# Chemical Weekly

VOL. XXXIV

AUGUST 29, 1989

NO. 51

*Chemox Chemox Chemox Chemox*

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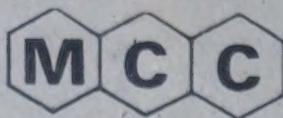
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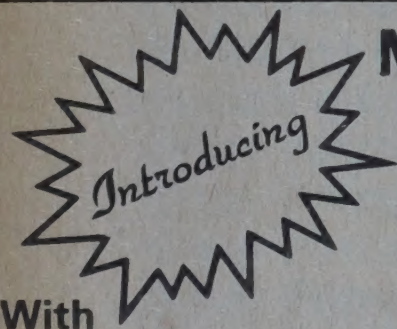
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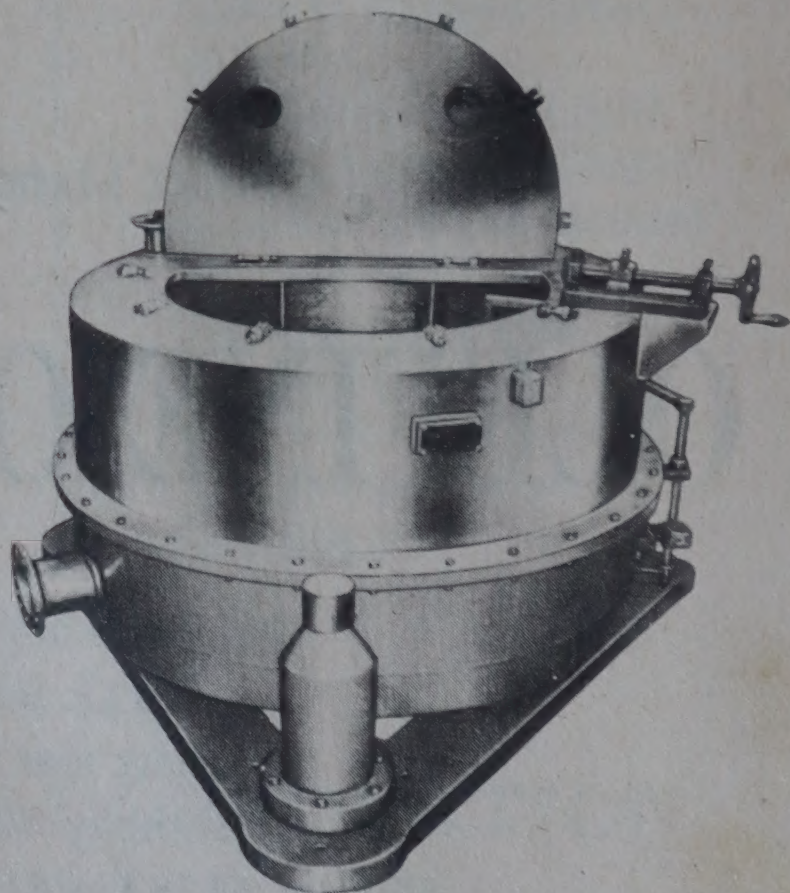
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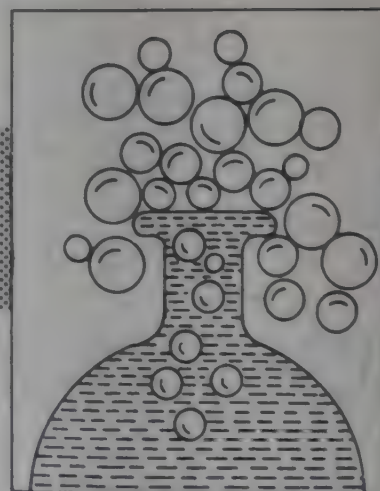


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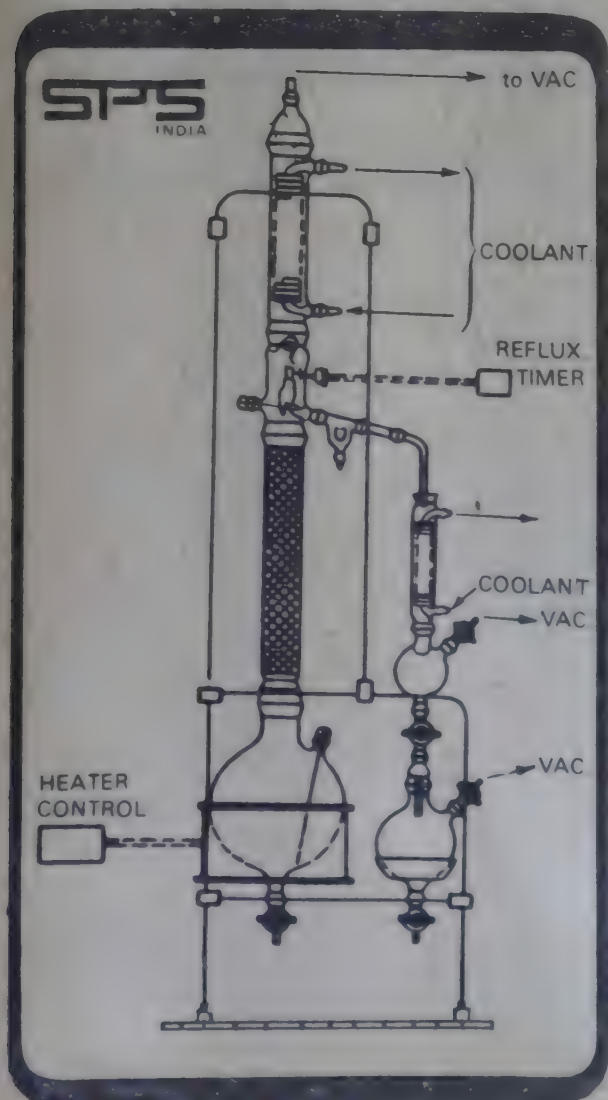
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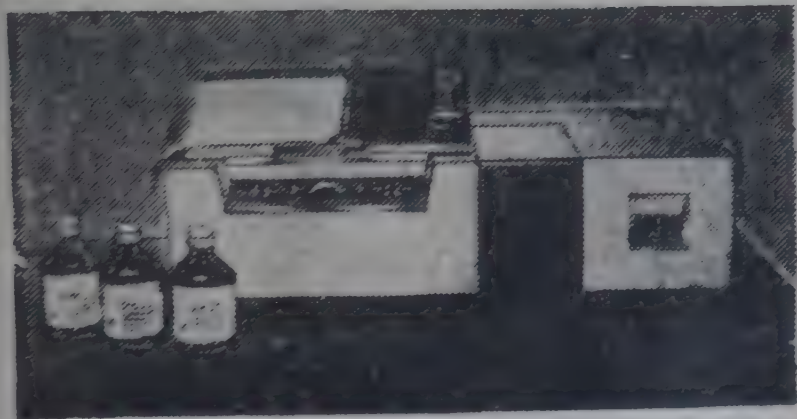
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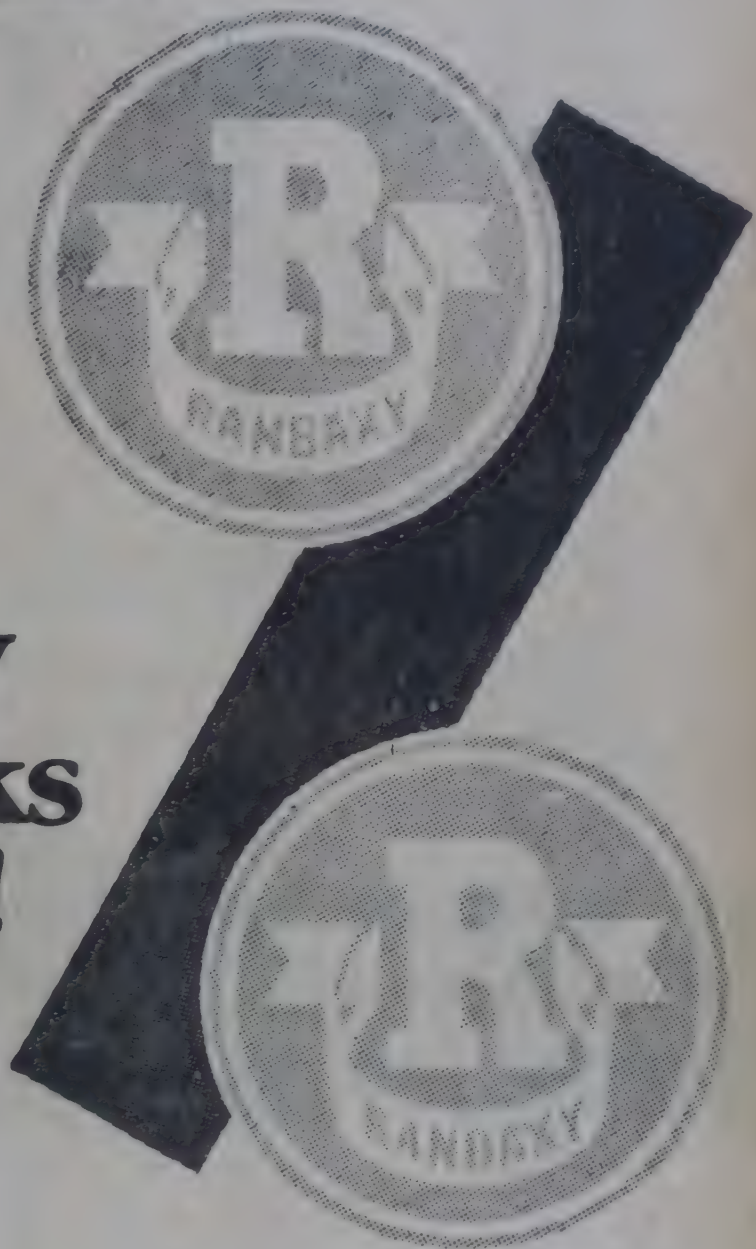
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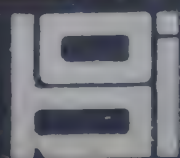
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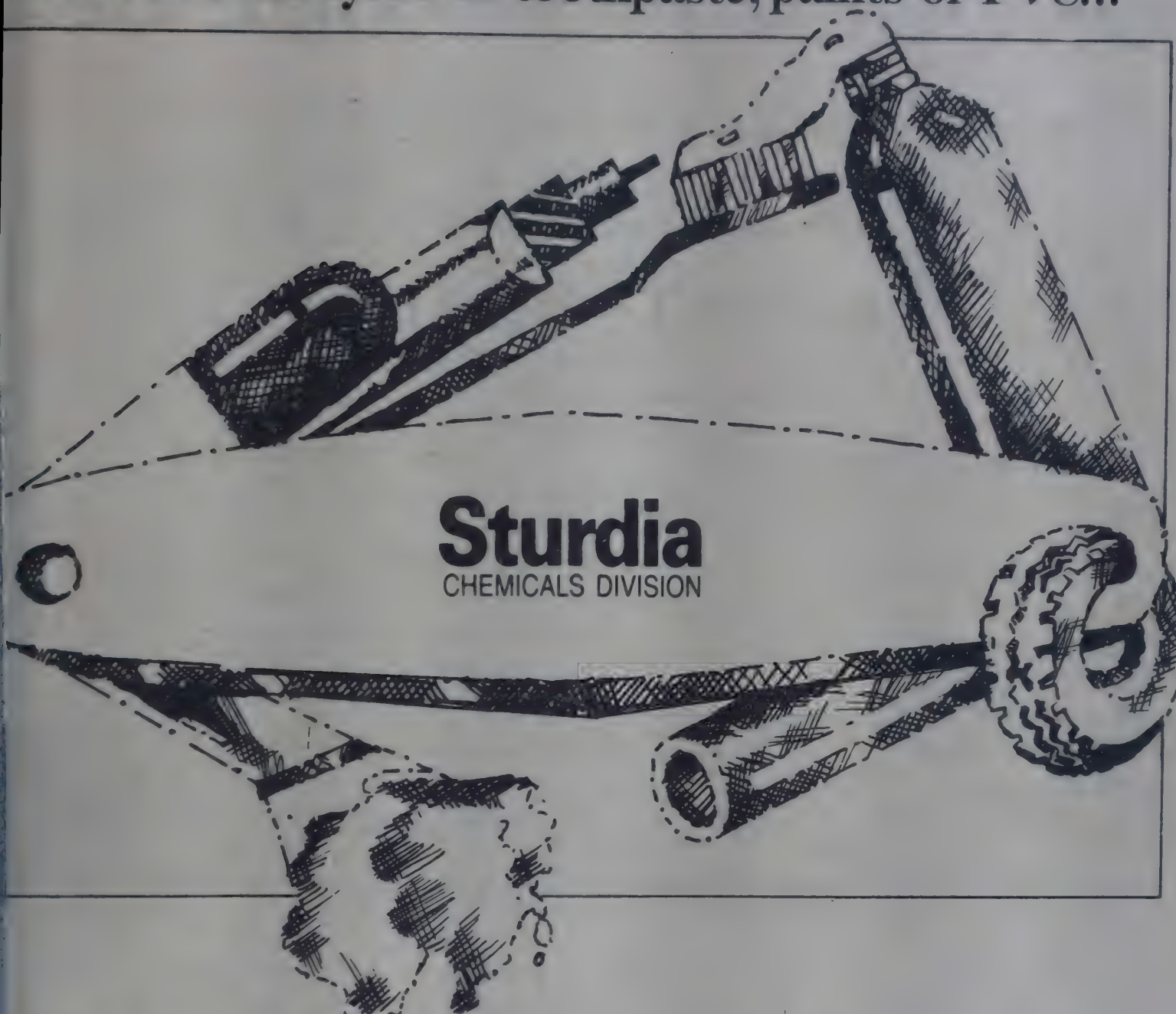


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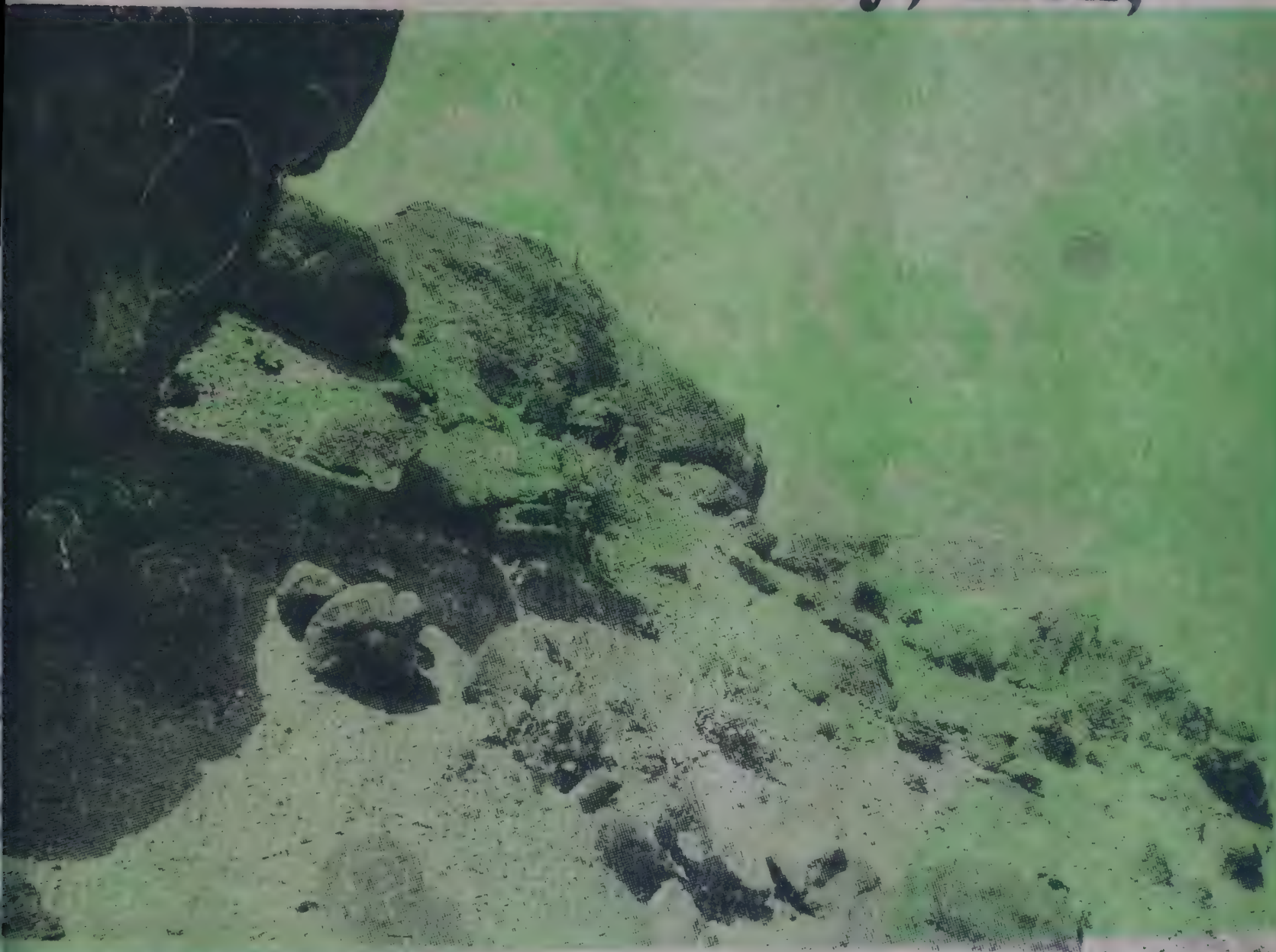
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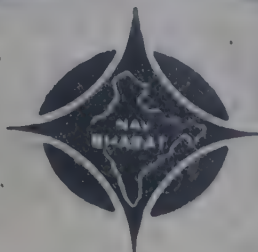
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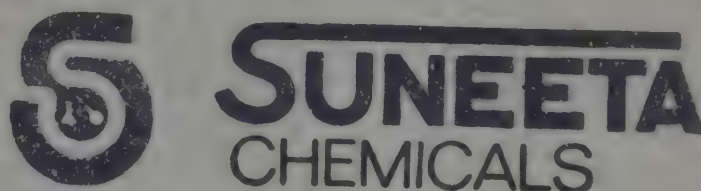
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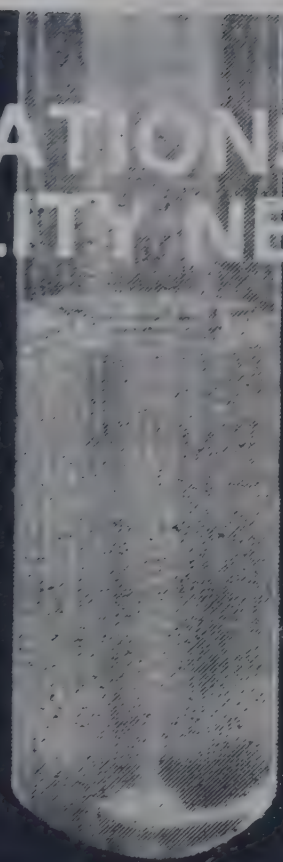
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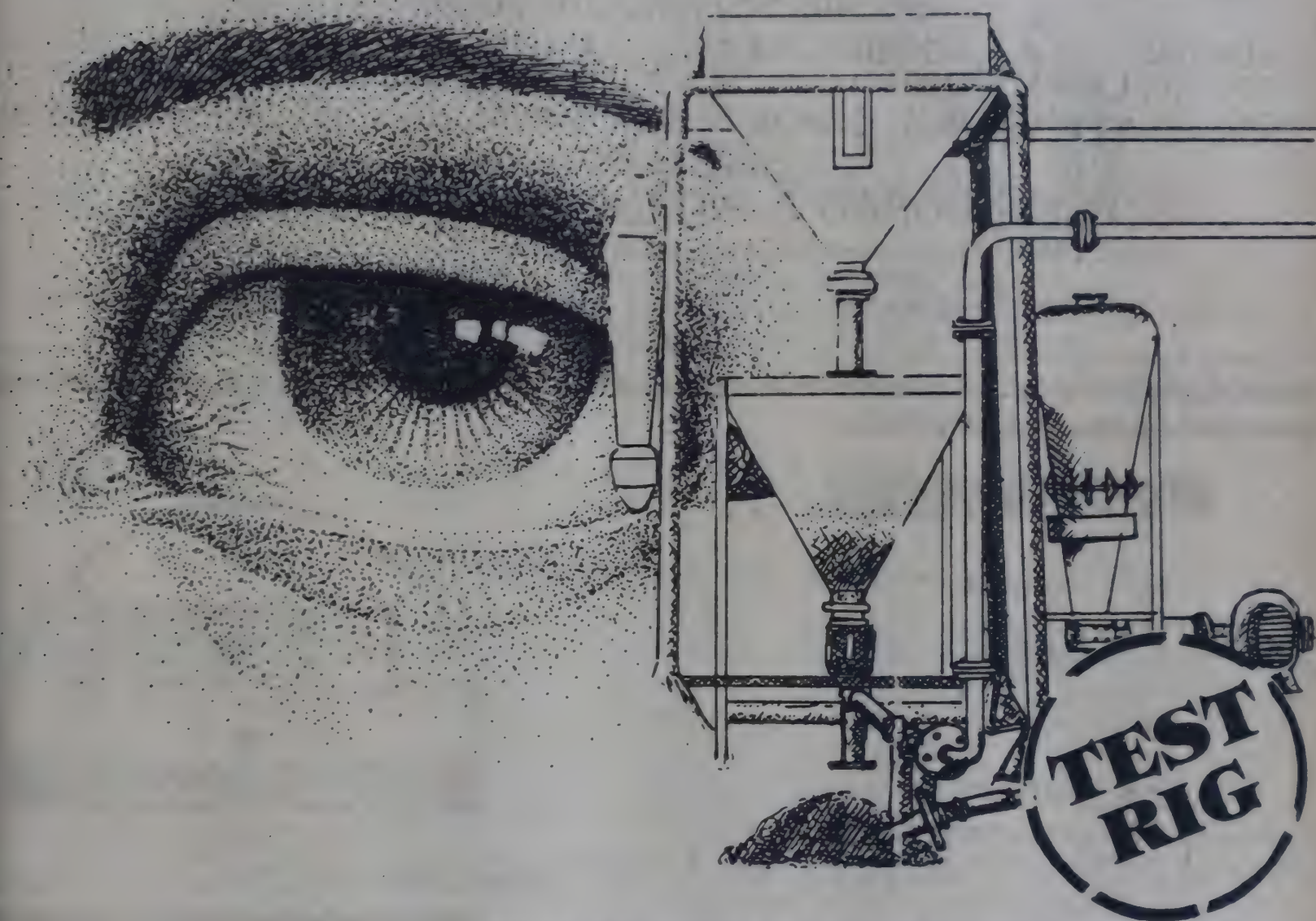
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# CHEMICAL WEEKLY

VOL. XXXIV

AUGUST 29, 1989

NO. 51

HERALDING THE 21st CENTURY - 26 (b)

## Ecology on the Brink -- Man's midflight madness

There seem to be good reasons why oxygen is now present at no more nor less than 21%. When free-swimming eukaryotes appeared in the early Proterozoic some 2,000 million years ago, levels of oxygen in the air of as little as 0.1% would have been sufficient to meet their metabolic requirements. Large, even massive organisms such as the dinosaurs that appeared in the Phanerozoic age could have existed only in a much richer oxygen environment. Too little oxygen, certainly less than 16%, and the metabolic requirements of large amphibians or reptiles would not have been possible, let alone of flying organisms and warm-blooded animals and birds. Too much oxygen, perhaps no more than 25%, and fires would constantly be raging, even in highly humid tropical conditions. Oxygen is also a highly toxic substance and organisms that deal with it must equip themselves with all manner of detoxifying agents, such as the enzyme catalase for eliminating hydrogen peroxide, one of its metabolic products in the cell. Again a satisfactory compromise has been reached and maintained.

Inherent to the Gaia hypothesis is the notion that the flow of essential nutrients through the system is promoted and regulated through the activities of living organisms. The entire Gaia system has many features in common with the physiology of warm-blooded animals, the atmosphere acting as a global lung, and the water system, including rivers and the oceans, acting like the blood in a circulatory system. All the living components of the system are like cells and tissues, each fulfilling unconsciously some role in the regulation process.

The nitrogen cycle is a classic example of nutrient interchange between terrestrial and aquatic organisms and the atmosphere. Nitrogen is an essential component of amino acids, proteins, and nucleosides, and the capture of nitrogen from the air is carried out by bacteria such as *Rhizobium* which live symbiotically in association with leguminous plants. According to estimates by Soderland and Svensson in 1976, terrestrial nitrogen-fixers capture some 139 million tonnes each year, and aquatic organisms upto 120 million tonnes. The fixed nitrogen is in the form of highly soluble nitrate, which is taken up by plants and converted into useful organic compounds such as proteins. When the plant dies, bacteria and fungi decompose proteins and other nitrogen-containing protoplasmic compounds into amino acids and then to ammonia, which either escapes into the atmosphere, where it undergoes oxidation to the gaseous oxides of nitrogen, or is converted again by bacteria into first nitrites and then to nitrates. If those nitrates are not taken up by plants then they may be reduced to nitrogen by denitrifying bacteria. Without the intervention of human beings, the cycle was in balance, nitrogen-fixation being counter-balanced by denitrification.

The use of artificial fertilizers adds at least 55 million tonnes to the terrestrial nitrogen balance and combustion in power stations and motor vehicles another 24 million tonnes. Those additions combined with other man-made perturbations of the sulphur cycle are beginning to cause fundamental changes -- most of them deleterious -- to a broad range of ecos-

ystems. Clearly the Gaian balances that have been established over aeons of evolution are delicately maintained.

Sulphur has proved particularly interesting from a Gaian point of view. Conventional wisdom had it that more sulphur was washed down to the oceans than was returned to the land. The same, indeed, was believed for another essential element, iodine. The sulphur was supposed to return, as much as did, in the form of hydrogen sulphide. But hydrogen sulphide is rapidly oxidized and where was the smell of rotten eggs? In the 1950s, Professor Frederick Challenger had discovered the substance dimethylsulphide to be a product of marine algae, and that gave the theoretician the clue as to the missing link for the flow of sulphur back to the land. Research work on the vessel R.V. Shackleton on its voyage from England to Antarctica revealed the presence of dimethylsulphide wherever one looked.

But why should marine algae waste energy on recycling sulphur back to the land for the benefit of trees and giraffes? In fact, marine algae carry substances in their cells to help them maintain osmotic pressure and prevent drying out. Dimethylsulphonic propionate is one such involatile neutral solute, and it is relatively easy for algae to make, since sulphur is plentiful in the sea. When the algae die, the solute breaks down to dimethylsulphide, which is highly volatile and escapes into the atmosphere. Onshore breeze carry the gas inland. Meanwhile, as the gas travels, it is transformed through oxidation processes, mainly involving a highly active oxygen derivative known as the hydroxyl radical, into sulphur oxides and is washed down to Earth in the rains.

The process is quintessentially Gaian. On land the sulphur promotes the growth of land organisms, not only as a vital element but also through its acidity bringing an increase in weathering and mineralisation. In return, terrestrial organisms speed up the flow of nutrients into the sea, thus favouring those communities of algae which include members that make dimethylsulphonic propionate to prevent desiccation. The methyl iodide also produced by marine algae could well be part of a similar Gaian process.

The dimethylsulphide of marine origin has now been shown to have another vital function. Sulphur compounds, particularly after oxidation, can act as condensation nuclei so that water vapour aggregates around them to form clouds, which will later bring rain. The sulphur compounds emanating from marine algae play a critical function in cloud formation over extensive areas of the planet and therefore may contribute powerfully to the hydrological cycle, helping to bring rain to landmasses. The cloud formation also has a powerful Gaian effect by serving to keep the planet cool, by reflecting sunlight back into space.

Nevertheless, the sea is by now four times saltier compared with the salt in our tissues; more over the sea's saltiness is close to the limits at which most normal exposed cells can survive. But why is the sea not many times



more salty than it is -- so much so that, except for a few bizarre salt-loving organisms such as those found in the Dead Sea, nothing living could survive in it? Indeed, estimates of salt run-off from the land suggest that the degree of saltness would be arrived at after only 80 million years of weathering and erosion, so that today the seaworld be much saltier, too salty for life. What has happened is that from Achean times to the present, enormous basins of ocean have been shut off by laying down mineral deposits, such as the stromatolite reefs of ancient bacterial communities, the limestone mountains of marine algae (such as those that still operate today in the Atlantic at the edges of the continental shelf) or the coral reefs of tropical waters. Exposed to the sun, those shut-off basins evaporate, leaving behind enormous salt deposits. But life often goes further, the bacteria of the mat communities actually coat the salt that has crystallized out of solution with a varnish to prevent its dissolving back again with the rains and tides. Geologists are now finding that all major salt deposits on land, the relics of ancient evaporite basins, are all contained within a fossilized limestone barrier.

But how is man affecting Gaia? Without question, his industrial activities are causing a ripple of perturbations that are pushing elaborate, often barely discerned balances out of kilter. The most-discussed change is to raise carbon dioxide levels which, through fossil fuel burning and the destruction of forests, have risen by 30% since the early 1800s and are likely to double within a century. The effect of that doubling of carbon dioxide on the global energy balance is some 80 times greater than the heat generated by the burning of fossil fuels and forest destruction that has given rise to the carbon dioxide in the first place. Scientists estimate that such a rise may lead to an average 2 to 3°C increase in surface air temperatures, with the effects becoming more exaggerated towards the Poles. The sea level will undoubtedly rise, threatening low lying areas but will it be followed by the melting of the ice-caps? What will happen to cloud cover, will it increase and so offset some of the heating effects? Will some parts of the globe, such as the semi-arid areas become drier still and other areas wetter? The climate will undoubtedly change, but perhaps in Gaian ways that will tend to reduce the impact. But the problem is not just carbon dioxide. Our activities are also increasing the build-up of other greenhouse gases. Methane for instance is now building up at the rate of one per cent per year as a result of forest destruction and its replacement as cattle ranches, as in Central and South America, or rice paddy. The CFCs, the chlorofluorocarbon gases now famous because of the controversy over stratospheric ozone depletion, are actually extremely potent greenhouse gases, some 10,000 times more than carbon dioxide. In fact, living organisms, such as certain fungi, produce gases very similar to CFCs insofar as they also potentially interact with ozone and bring about its destruction. In terms of the quantities involved to date, the manufactured CFCs are unlikely to have had significant effect on stratospheric ozone, but there should be concern that levels do not build up to the point where significant greenhouse effects occur.

There is considerable controversy over exactly what is happening to stratospheric ozone. The problem at present is not ozone depletion but ozone build-up in the lower atmosphere brought about through fossil fuel combustion. Nitric oxide, one of the gases generated during combustion, particularly in motor vehicles, acts as a catalyst in the production in the atmosphere of both ozone and hydroxyl. Hydrocarbons, such as methane and unburnt fuel, are part of this catalytic process, and the overall consequence is that the atmosphere over industrial areas is becoming increasingly oxidizing and therefore acidic as sulphur and nitrogen compounds are converted into sulphuric and nitric acids. To exacerbate the acid problems still further, the flow of excess nutrients into the oceans, as a result of urbanization and intensive agriculture, is bringing about a massive increase in marine algae and as a consequence an increase in the production of dimethylsulphide.

The acidification of Scandinavian, Scottish and North American rivers, lakes and soils is therefore the result of accelerating a number of different, but interrelated processes, involving both oxidation pathways and nutrient cycles. The dyeing of forests in the northern hemisphere is undoubtedly associated with such changes and most surely alert us to the dangers of continuing our present industrial life style with its emphasis on high-energy-

consuming activities. Ironically, with carbon dioxide and other greenhouse gases rising in concentration we need our forests intact as perhaps never before. Yet, apart from having brought sickness and death to our forests we are now engaged in an all-out attack on the magnificent tropical forests encircling the Equator. That such forests exist at all on such depleted, eroded, toxic soils, is evidence of the subtle feedback mechanisms and symbiotic relationships that have evolved through life's innate creativity. Our attempt to replace such forests with cattle ranching and monoculture plantations proved in the main a disaster to the locality and as we now begin to desert far further afield. In higher latitudes we depend on tropical forests to keep us warm through the circulation of water vapour and to help maintain an atmosphere that supports life as we know it. Perhaps as much as 90% of all species on Earth are to be found in tropical areas, yet within the space of decades we are tearing all apart. The rate of extinction of species today as a result of our interference, may be many hundred times greater than the recent geological past. To destroy such a large chunk of the living ecosystem, when we do not properly understand how it all works, is like pulling apart the control system of a modern aircraft while in mid-flight.

In many respects the three Cs, cars, cattle and chainsaws have become prime weapons against GAIA.

Never before in our history has the organic world around us been in so much trouble. Whole forests in both the tropical and temperate zones are dying from acid rain radiation, air pollution, timber harvesting, slash and burn agriculture. Harbours, estuaries, seas as broad as the Mediterranean, the river Rhine are all in decline from toxic waste. Between now and the end of the century the extinction rate among higher vertebrates will be as much as 400 times higher than the average rate that prevailed over the history of evolution. As these creatures that have evolved with Man, are disappearing by Man's hand, many of the Earth's ecosystems will go with them. Man is creating an environment of gases, wounds, disorganisation and death. Each minute of each day, a rain forest is being devoured by machines, bulldozers or fires.

The way to reform, Aldo Leopold wrote, lies not in building roads through lovely country side, but in building "receptivity into the still unlively human mind". "To destroy such a large chunk of living ecosystem, when we do not properly understand its intricate working is like pulling apart the control system of a modern air-craft in mid-flight". It is a great tragedy that people of considerable intellect and ability who have been most indifferent to the natural order and who stand in greatest need of learning to see it with their own eyes again. Enlightenment will not occur simply through the accumulation of more and more scientific knowledge.

Nature is a creative work that has been going on for billions of years before there was any mind to translate it into human understanding. It is a ceaseless and infinitely inventive process of creating. It has no purpose behind it that we have been able to find and agree on, but it does display at every moment an order far more complicated and marvelous than anything we have been able to design. It is the grandest beauty there is, speaking to us of the most comprehensive order and value. In restoring some of the primordial beauty to a ravaged Earth, we may, with Aldo Leopold, begin to see again much we have forgotten.

Caterpillar bulldozers have become prime weapons against Gaia. However, as the ancient Greeks and other early civilizations realised full well, our own well-being depends first and foremost on how we treat the Earth. Gaia would reward mankind with her bounty when treated well, but eventually she would revenge abuse. As Chief Seattle told the US Government in 1855 when his people were betrayed once again: "If men split upon the globe, they split upon themselves. This we know, that the Earth does not belong to man; man belongs to the Earth..... Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself."

-- T.P.S. RA.

[Condensed from an article entitled 'Man and Gaia' by James Lovelock (author of the GAIA hypothesis) in the Earth Report -- The essential (to Global Ecological Issue --Editors: Goldsmith and Hildyara).



# CHEMARENA

S.L. VENKITESWARAN

## AIDS Menace

It is only nine years since the new menace to the health and life of humanity made its appearance -- AIDS or Acquired Immuno Deficiency Syndrome in the West. It has evolved into an epidemic and world-wide public health crisis and a subject of immense concern to the WHO, NIH and many of the organisations dealing with public health problems as also intense R & D to provide a cure or antidote. According to WHO, 157,000 cases have been reported from 149 countries as of beginning of June 1989. But the data is incomplete and the number may be half a million actually affected and over 5 million probably infected with the causative virus but not yet a victim of AIDS. The number could rise dramatically in a short while as has happened in Thailand, though India is a fairly safe area at present.

AIDS is caused by two viruses HIV-I and HIV-II -- Human Immuno-deficiency Virus -- and these have been identified and their molecular composition and effects and epidemiology studied extensively by an array of researchers, doctors, medical ethicists, AIDS social activists, and of course the bureaucrats in Government and semi-Government agencies. It is a virus which invades the body's defence mechanism and the cells responsible for it -- the white corpuscles -- and immune system and destroy slowly the ability to fight off infections. The victim succumbs to opportunistic infections like pneumonia in a short period. But unlike the other infectious diseases HIV is not transmitted by physical contact or water or infected foods. It is passed on through sexual activity and infected syringes used by drug addicts. Hence the special interest of social activists and the calls to educate the public on how to avoid such infection. But how do you tackle the illiterate millions in Africa from where the dreaded disease originated? Is this a curse on the western world which claims to have totally eliminated the era of infectious diseases or on the liberal ethics of present day?

What is most remarkable is however the efforts in research on the cause of the disease, identification of the virus (or retrovirus as the dormant form is called) which causes it and efforts to find drugs or vaccines to overcome the virus. However remarkable the work, there is yet no cure but hopes are on the horizon, but AIDS will remain a world-wide health problem for years. Presently the antiviral drug AZT or Zidovudine is one drug for its treatment which is approved but it

has toxic side effects besides the problem of resistant strains of the virus. Other drugs which act on the same principle of fooling the virus into taking on a false look-alike nucleic acid into its DNA and stop replication are also getting ready and DDC or dideoxycytidine may get approval for use along with AZT.

Apart from feeding in false nucleic acid the major effort is on other ways of blocking the spread of HIV in infected individuals. The protein on cell surfaces to which HIV binds itself for entry is one target so that such a protein or parts of it (polypeptide) can be supplied to bind most of the virus and reduce the number gaining entry into cells to start its havoc. CD<sub>4</sub> is identified as the protein and recombinant versions are developed. A further innovation is to attach potent toxins to the CD<sub>4</sub>. Another approach is to identify the parts of HIV which stimulate immune response and produce vaccines to counter.

The problems are in making HIV vaccines relate to its staggeringly complex life cycle in the human body. "HIV's effects on the immune system and its exquisite molecular communication among many cell types are pervasive and pernicious". Added to this is that there are no animal models which could serve for guidance on therapies and vaccines. Only macaque monkeys develop immuno deficiency through a close relative of HIV termed SIV, Simian Immuno-deficiency Virus. Some transgenic mice are being evolved which could be affected by HIV. There are over 50 companies and numerous hospitals engaged in the research. Over 60 drug candidates have been proposed which are nucleoside analogues or can block action of the enzyme reverse transcriptase which is necessary for transcribing the RNA genome of HIV into a DNA copy or blocking the binding of the virus to the cell surface or in providing protein moieties which bind on the virus and prevent entry into the cells. But work has to extend over years before coming up with a promising drug which then has to undergo rigorous testing for toxicity and side effects interaction with other drugs, much of it on humans. Presently the AZT therapy approved can only prolong life of AIDS victims and not a cure. It is useful only if taken early -- which requires early detection -- and then again it only delays onset of AIDS or AIDS related conditions (ARC). Extended use defeats the purpose by side effects or resistant strains.



The risk of HIV infected persons developing opportunistic infections is said to be reduced by Alpha interferon. Specific treatment of such infections have also been tried out such as of aerolised pentamidine to treat pneumocystic carinii pneumonia. The way HIV enters and functions has been fully elaborated. The key step is interaction of the viral envelop glycoprotein GP 120 with CD<sub>4</sub> present on the cell surface, an antigen molecule and then moves in to replicate itself through the transcriptase enzyme. Great hopes rest on the ways of preventing this link up of GP 120 and CD<sub>4</sub>. Recombinant soluble versions of CD<sub>4</sub> have been shown to block HIV infection of T<sub>4</sub> lymphocytes (white corpuscles) and are also non-toxic. But CD<sub>4</sub> has a life of less than an hour in the blood and its cost is astronomical. Ways of extending the life in the blood through coupling to immunoglobulins are successful. The coupling of CD<sub>4</sub> with toxins can kill infected HIV-I and HIV-II cells -- CD<sub>4</sub>-PE<sub>4</sub>O as one such preparation is called. Also linking CD<sub>4</sub> with the protein toxin ricin is another effective way. The various methods and innovations being studied are fantastic but far away from any effective cures as yet.

A team under Nobel Laureate Prof. Salk of Polio & Hepatitis B vaccines fame is also working on vaccines but here again it is going to be over extended periods with possibil-

ities of more strains of HIV and resistance build up meanwhile. For vaccines, there is no animal to base on and the effective way is based on inactivated virus particles and testing also on humans -- both will raise a hue and cry. Vaccines prevent development of disease after infection occurs and do not prevent infection and hence the use of infected viruses is not objectionable if at all it leads to a useful vaccine.

Efforts to understand the "molecular biology of the human immunodeficiency viruses and their interactions with human immune system cells are central to the eventual development of strategies to treat AIDS" The enormous and wide range of research in this field presented at annual conferences gives hope for early solutions. Actually there is widespread infection with one of the numerous HIV strains and only the terminal stages of such infection emerge as AIDS. Enormous funds have been provided in USA and elsewhere -- \$1.3 billion in USA for 1989 as compared with \$1.5 billion on cancer and \$1 billion on heart disease -- the major killer of today. There is also \$900 million budgeted for care of patients as per promises made in the last Presidential campaign.

India has to be on the lookout for developments and have a programme for screening and prevention so that AIDS does not strike the country in the coming years.

## Acetic acid situation normal

After 18 months of hectic efforts the huge acetic acid plant of Hoechst Celanese in USA is back in full production. This together with the new B.P. Chemicals plant in U.K. have put an end to shortages and higher prices for acetic acid over the past two years. Price level which exceeded \$600 per tonne have slumped back to \$ 450 delivered in Far East and corresponding lower prices in Europe. In India the situation has remained easy with adequate production since late last year but now fall in demand due to the disruption of Reliance's PTA plant in Patalganga.

The point to note is that the process based on butane oxidation is still economic for the US conditions and the influx of the methanol carbonylation plants have not displaced them. But the idled ethylene based production via acetaldehyde which came to the rescue to meet the shortages have again been shut down or moth-balled. But still a lot of production is on this route at Huls in West Germany, Lonza in Switzerland, Celmex in Mexico and at other centres including Hoechst in West Germany and in Japan. Ethanol based production is perhaps only in India and Brazil. World production is 3.5 million tonnes and has been receiving a boost from the increasing PTA capacity but will remain at 2 to 3% growth in the coming years, in line with GDP growth rates.

The use pattern for US is --

|                   |     |
|-------------------|-----|
| Vinyl acetate     | 36% |
| Cellulose acetate | 18% |
| Esters            | 13% |
| PTA               | 9%  |
| Monochloroacetic  | 5%  |
| Acetic anhydride  | 5%  |
| Others            | 14% |

India's recent growth in demand has been for VAM and PTA but here also not at high rates. Cellulose acetate has remained the greatest disappointment in India and perhaps even the limited use of triacetate for X-ray films is on the way out due to the new plants based on polyester film both by HPF and now Garware. The major thrust in India will be PTA when the new plants are built and for VAM.

One of the features of the recent developments is the combined production of acetic anhydride and acetic acid through carbonylation process -- an innovation first introduced by Eastman and now BP Chemicals with their own version in their new plant. Hoechst-Celanese also claim to have the technology but are not sure when it will make its debut -- probably when they shut down their present ethylene base production in West Germany. Hoechst with Hoechst-Celanese is the world's number one with over a million tonnes and BP are number two with 870,000 tonnes.



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## Sulphur import becomes cheaper

A well-conceived strategy adopted by the Minerals and Metals Trading Corporation (MMTC) coupled with some favourable factors has changed the international sulphur scenario. Within less than a year the market for sulphur, which used to be a seller's one, has turned into a buyer's market. Its price has come down by an incredible \$25 a tonne in the past five months.

India imports two million tonnes of sulphur at a landed cost of about Rs. 400 crores every year. These imports are canalised through MMTC. Certain quantities of sulphur are purchased through long-term and annual contracts with Poland, USSR, Bahrain, Qatar, Abu Dhabi and Canada. The balance is purchased mostly on the basis of spot tenders and negotiations.

One of the major sources for sulphur which is nearest to India is Saudi Arabia which produces nearly one million tonnes of sulphur a year for exports. However, India has not been able to obtain a long-term contract with Petromin, the petroleum ministry of Saudi Arabia, for the supply of sulphur. So far supplies from Saudi Arabia have been through international trading companies as Petromin has been spurning all overtures from MMTC for direct long-term contracts.

To make things worse for India, a few months ago Saudi Arabia introduced a two-tier pricing system under which the free-on-board (FoB) price of sulphur from Saudi Arabia, called the government established price (GEP), was \$110 a tonne for countries other than India, and \$115 a tonne for India.

This was considered unfair and MMTC evolved a strategy to make Saudi Arabia see reason and put an end to the dual pricing system. During the period, MMTC made purchases from sources other than Saudi Arabia with the result that from April 1, 1989, Saudi Arabia was forced to end the discrimin-

atory pricing system to avoid the glut resulting from MMTC's unwillingness to buy sulphur from Petromin.

Petromin not only reduced the prices but made the \$105 a tonne price applicable to all the countries. Thereafter, India bought a nominal quantity of 3,00,000 tonnes of sulphur in shipments spread over three months from Petromin. Meanwhile, a stalemate has been continuing between the Indian Department of Fertilisers and Morocco over import of huge quantities of phosphoric acid. India has been a major buyer of Moroccan phosphoric acid.

Since India is not buying it for the past eight months now, Morocco has virtually stopped production of phosphoric acid. Since Morocco used to import large quantities of sulphur for the production of phosphoric acid, its absence from the world sulphur market has resulted in downward pressure on sulphur prices the world over.

In such a situation, Canada is also facing serious problems in selling its sulphur. MMTC took advantage of the situation and forced the Canadians to lower their prices to one of the lowest in recent times. So far, to keep the sources of sulphur supplies diversified, India has been importing Canadian sulphur at prices of at least \$10 to \$15 a tonne higher than the prices paid for West Asian sulphur. But now it has been possible to get Canadian sulphur almost at the same landed cost as the West Asian sulphur.

This had a salutary effect and from August 1 last even Petromin reduced the price of its sulphur to \$90 a tonne—the lowest in years. Since sulphur is now a buyer's market, MMTC has secured counter-trade obligations which were not possible in the past. Moreover, MMTC has also been pressing for direct long-term contracts with Petromin which the latter has agreed to now. An MMTC delegation will visit Saudi

Arabia in about a week's time to negotiate the elusive long-term contracts.

## KERALA-KONKAN BASIN: FIVE WELLS TO BE DRILLED

Commercial exploitation of oil and natural gas is expected to begin in three years in the Kerala-Konkan basin following findings which indicated an estimate of 1,600 million tonnes in the region.

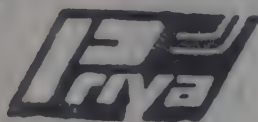
The Union Minister of State for Information and Broadcasting, Mr. Krishnakumar, and the Union Petroleum Secretary, Mr. H.K. Khan, told a joint news conference at Cochin on August 23 that five wells would be drilled in the region, located 75 km off Cochin by the middle of next year. Three of the wells would be drilled by the Oil and Natural Gas Commission (ONGC) and two by foreign companies. They said out of the 1,600 million tonne reserve, 150 million tonnes are estimated to be available for commercial exploitation in the next 15 to 20 years.

Mr. Krishnakumar and Mr. Khan said a special task force has been set up to speed up exploratory work in the region for which an ONGC vessel, M. T. Anweshak, has reached Cochin. The vessel will undertake detailed exploratory work for one year beginning September 15. They said ONGC, which had spent Rs. 35 crores so far for oil exploration in the region, would spend Rs. 65 crore more in the next three years. It also proposes to set up a regional office at Cochin to supervise the on-going work.

## U.S. SAFETY AWARD FOR IPCL

The Indian Petrochemicals Corporation Ltd. (IPCL) has for the eighth time bagged the prestigious "award of honour" of the U.S. National Safety Council. According to an IPCL statement, the award has been conferred in appreciation of IPCL's accident-free operations of more than three million man hours.





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## How to create a market niche?

Market niche is the crux for success of any business, a factor somewhat ignored in India. We illustrate it here by two real life examples from diverse fields, one in the old fashioned food business and the other in the high-technology area of computers. Our first story (Alicia Johnson: ERNIE TOWNSEND — CHIPPING OUT A NICHE IN FROZEN DINNERS, Management Review, July 1987, page 19, 20, 22) relates to the All American Gourmet Company (AAGC) and its moral is aptly summed by the president, Ernie Townsend:

What you try to do is cross the hairs of value and good taste. Once you get them lined up, you get a successful concept....The market is rapidly changing....and the consumers tastes are much more sophisticated than they were 10-15 years ago....

In 1983, AAGC entered an already flooded market of frozen dinners and the critics labeled this venture as an 'also-ran' but forgot that Townsend had done his homework and identified a market gap between the Campbell's expensive Le Menu line and the Swanson dinners at the lower end. Budget Gourmet's \$1.69 dinners fitted beautifully between the two and thus created its own 'market niche'. Its choice of 12 dinners with no preservatives, additives or fillers were all offered at the same price and required uniform cooking time and oven temperature. All these were decisive selling points and the new range of products was an instant success. The acceptance of this range in the market was instant and it attained soon a 14% share of the \$3 billion frozen single dish market. And Townsend, who cannot stand doing anything slowly, is aiming at \$7-9 billion business in the 90's. His recipe and philosophy for rapid growth:

Costs are continually out of control in this business, and that's what growth is all about. I like taking risks and watching the growth, but I'm pretty conservative in the same sense, because I'd rather work under a large organisation than have my own business.

AAGC is held (75%) by General Host whose chairman Ashton 'pinched' Townsend, then vice-president marketing at Van de Kamp, for turning around Tambellini Foods, the Italian entree subsidiary of General Host. At that time, TF sales were a mere \$4 million and losses \$1 million, there was no cost control. Townsend replaced the Italian foods by

Budget Gourmet and had such confidence in his venture that he gave it everything he had. The marketing strategy emphasised quality foods at bargain prices and the advertisement relied on humour, cartoon art and pictures of the product. Typical of these: 'One bite and you'll wonder why you:

paid so much for so many others or have been paying such a fat price for a lean cuisine.

The trick worked like magic and a market niche was created amidst the 'flood'. Our second story relates to IBM the 'snowwhite and the seven dwarfs' company — the giant in the computer field. It is based on an interview with the IBM's former vice-president of marketing (AN INTERVIEW WITH BUCK RODGERS — SELLING SOLUTIONS AT IBM, Management Review July 1987, page 48-51), a much sought-after speaker talking about what he learned in his 3 years of selling. An undisputed leader and by far the number ONE in the field of computers, it turns out that the foundation of its success is the 'small-company' feel that has been developed right from its inception. This has been maintained throughout its growth to the now largest among the computer companies by maintaining a manager-to-employee ratio of about one to 12 and decentralising power and authority down to the action level. Buck Rodgers joined IBM in the year 1950 when its sales were \$250 million. The company organisation structure was reverse of the conventional one with customer right at the top and sales representatives and managers underneath. Appointments with customers had priority over meetings in the IBM executive suite. A major sale to an aircraft manufacturer was clinched by Rodgers on the basis of his promise that he would fly to the customer's place every month for 6 months to ensure success of the complete installation. And the promise was, of course, kept. How did he rise to the top of the marketing ladder? Through two basic and simple elements: commitment and integrity. And the secret of IBM's legendary success? Three simple beliefs:

Respect for the individual

Give the best service of any company in the world

Expect excellence from what people do

These three beliefs enunciated by Tom Watson Sr in 1911 remain unchanged to date. How does he persuade customers? Through listening! Not easy, but it establishes trust and confidence. IBM'ers are well motivated through training and open communication, also their salary and incentives are on a 50:50 basis thus ensuring adequate payment for performance. No wonder, IBM has created and maintained a 'niche' in its market.



## RIL proposal to develop Gandhar oil fields rejected

The Union government has rejected Rs. 1,200-crore proposal of Reliance Industries Limited for developing the Gandhar oil fields and the full utilisation of natural gas in Gujarat. According to official sources, the RIL application has been rejected on the ground that the public sector Oil and Natural Gas Commission (ONGC) is already developing the Gandhar fields.

This is RIL's second attempt to enter the oil sector. Earlier, it had sought government approval to set up two refineries at an estimated cost of Rs. 2,400 crores. These applications were also rejected on the ground that this area was reserved for the public sector. RIL's proposal for development of the Gandhar fields involved the establishment of a new undertaking with the aim of producing 7,600 tonnes of oil per day, six million cubic metres of lean gas, 10,00,000 tonnes per annum of LPG, 10,00,000 tpa of NGL and 4,00,000 tpa of C-2 and C-3.

The company planned to raise funds for the Rs. 1,200 crore project through issue of equity capital, internal cash accruals, debentures, loans from financial institutions, banks and foreign exchange loans. In the case of the refinery projects, the first one involved processing of six million tonnes of crude oil to make 90,000 tpa of C-3 LPG, 30,000 tpa of C-4 LPG, 10,00,000 tpa of gasoline, 10,00,000 tpa of kerosene and ATF 17,00,000 tpa of diesel oil and 1,70,000 tpa of fuel oil. This project, proposed at Bharuch in Gujarat, envisaged an expenditure of Rs. 1,735 crores.

Its second refinery project related to the processing of two million tonnes of residual crude oil for making 1,00,000 tpa of high viscosity lube oils, 50,000 tpa of transformer oil base stock, 25,000 tpa of 150 neutral base stock HVI, 90,000 tpa of 500 neutral HVI base

stock, 35,000 tpa of 1300 neutral HVI base stock, 4,25,000 tpa of carbon black feed stock and 5,60,000 tpa of asphalt paving grade. This project was envisaged at Bharuch or any other area on the west coast.

For both the refinery projects, the company planned to raise funds through issue of equity capital, internal cash accruals, debentures, loans from financial institutions and foreign exchange loans. In rejecting the proposals for the refineries, the government gave a common argument. It said the refineries were reserved under the industrial policy resolution of the government. Accordingly, the question of setting up refineries in the private sector just did not arise.

Further, the govt. maintained that the question of creating additional refining capacity in the country, its location and

whether any of the new units, should be in the joint sector, was still being considered. The RIL proposal, therefore, could not be considered at this stage.

### KERALA TOPS IN RUBBER-BASED UNITS

Kerala which accounts for 90 percent of the country's total production of 259,000 tonnes of natural rubber has slowly turned out to be the largest consumer of the raw material among other States, accounting for 14% of the total consumption. Kerala's consumption of natural rubber during 1988-89 was estimated at 43,800 tonnes followed by Maharashtra (43,170 tonnes), Uttar Pradesh (41,000 tonnes), and West Bengal (35,900 tonnes), according to a directory brought out by the rubber goods manufacturers in India. Production of natural rubber, however, is yet to reach self-sufficiency with rising demand which touched 313,830 tonnes, leaving a shortfall of nearly 55,000 tonnes which was being met through imports.

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## Rs. 275-cr USSR order for pharmaceutical units

Leading pharmaceutical units, including Cadila, Ranbaxy, Lupin, M.J. Pharma, E. Merck, Hoechst and Lyka have secured Russian orders worth Rs. 275 crores.

This follows the visit of Mr. Zaikin Nikolai Ivanovich, Director of Medexport's Department of Price. Mr. Ivanovich visited manufacturing units in Bombay, Baroda and Delhi earlier in August. This is the first time many small units and multinationals got their first direct orders from Medexport, according to Mr. Ramu Deora, Chairman of the Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council (Chemexcil).

In an interview with journalists at Bombay on Aug. 22, Mr. Deora said that Medexport has requested that India send the material by special charter flights as Soviet Union badly needs the products ordered. The matter has been taken up with the Commerce Minister, Mr. Dinesh Singh. Timely shipment holds forth the prospect of further orders this year, Mr. Deora said.

The Soviet Union has sought Chemexcil's assistance in registering more drugs with the Soviet health authorities. Mr. Deora, who led a delegation of Indian exporters to the USSR recently, said the Soviet Union proposed to buy Rs. 1250 crores worth of medicinal products by the year-end. According to trade sources, about 20 to 25 per cent of the import bill would come in from India, and a similar contribution from hard currency areas. The balance would be supplied by the Eastern Bloc nations.

Meanwhile, Chemexcil has fixed a target of Rs. 2100 crores for the current year (1989-90). At the same time, hectic efforts are under way to surpass this and achieve an export turnover of Rs. 2400 crores, which would mean a 100 per cent increase over last year's figure of

Rs. 1200 crores, Mr. Deora said.

Chemexcil has released export figures for the period April-June 1989. Pharmaceuticals (bulk drugs and formulations) touched Rs. 78.8 crores, showing a 53.6 per cent rise over the figures for the corresponding quarter last year. Thanks to good monsoons, exports of medicinal castor oil rose by 108 per cent.

Exports of dyes and dye intermediates rose by 55.1 per cent, touching Rs. 73.9 crores. Agrochemicals and miscellaneous chemicals recorded a 141.3 per cent increase, amounting to Rs. 55.58 crores. Soaps, detergents and toiletries segment grew by 131.7 per cent, touching Rs. 56.87 crores. Agarbatti exports grew by 51%. Exports of essential oils grew by 39%.

Actual exports could be more than the above figures. This is because the above data has been compiled from the daily customs list from Calcutta, Madras and Cochin ports and the monthly returns submitted by exporters. There is considerable lag in receiving the daily customs list from Bombay customs. As information pertaining to exports effected by land routes, minor ports as well as by air has not yet been received, the same is not reflected in the above data.

### ENERGY FROM GARBAGE

The Corporation of Madras has drawn up a project to tap electrical energy from the huge quantity of garbage generated in the city daily. Under the project, to be executed by the Bharat Heavy Electricals Ltd., 25MW of electricity will be generated from the 2500 tonnes of garbage which is accumulated in the city everyday.

A high level team of officials from the BHEL explained the features of the project to Corporation officials, includ-

ing the Special Officer, Mr. L. Menezes, and the Commissioner, Abdul Hassan. According to the Commissioner, the BHEL has drawn three alternative methods for the project and is working out the cost of scheme and also the place to erect incineration plant. The plant will incorporate the latest fluidised bed boiler technology.

### FERTILISER CORPNs. INCUR HUGE LOSSES

Many units of the public sector fertiliser corporations have incurred huge losses in 1988-89, according to the provisional accounts. Hindustan Fertiliser Corporation's Namrup-I and Namrup-II have together incurred losses of Rs. 45.34 crores and Rs. 18.23 crores. Its Durgapur and Barauni units have shown losses of Rs. 53.62 crores and Rs. 42.61 crores respectively. The Fertiliser Corporation of India's units at Sindri, Gorakhpur, Ramagundam and Talcher have recorded losses of Rs. 21.75 crores, Rs. 19.08 crores, Rs. 26.43 crores and Rs. 66.34 crores respectively.

National Fertilisers Ltd.'s Bhatinda and Paradeep phosphates plants have lost Rs. 7.24 and Rs. 7.92 crores respectively. The losses in the Hindustan Fertiliser and Fertiliser Corporation plants have been attributed to low capacity utilisation on account of power and labour problems, design deficiencies, old and obsolete technology, equipment breakdowns and surplus manpower.

Reasons for NFL's Bhatinda plant losses have been equipment and power problems and non-availability of phosphoric acid in the case of the Paradeep plant. Steps taken to reduce the losses include rectification and replacement of old equipment, setting up of captive power plants, revamping power plants, revamping of the lower and middle management, voluntary retirement scheme and arranging imports of phosphoric acid.



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## Government may clear Thapar-Du Pont nylon-66 project

The Government is likely to buckle under the psychological pressure mounted on it by the US Government through its Omnibus Trade Act and grant clearance to the long-standing Thapar-Du Pont proposal for the manufacture of nylon-66 in the country.

The apprehensions that the decision on the project will be strongly influenced by reasons other than mere merits of the case are borne out by the reports emanating from Washington which claim that one of the provocations for naming India under the 'Super 301' was the rejection of the Du Pont and Coke proposals.

Although the Indian Government has publicly professed to stand up against the US pressures, informed sources say that it is under tremendous pressure to disprove the US contention that India is an unfair trade partner. Clearance to Thapar-Du Pont proposal may be opted by the Government as one of the symbols of its openness. The US government it is learnt has made its displeasure plain at the delay in granting clearance to the project.

The proposal was earlier buried unceremoniously by the Government on grounds of large foreign exchange outflow, perpetual import of raw materials and no visible advantage in technology. The revised proposal by Thapar-Du Pont came up for the clearance at a recent meeting of the Projects Investment Board (PIB).

It is learnt that at the meeting the Petroleum Ministry favoured clearance of the project with 42 per cent export commitment which in its opinion would ensure no net foreign exchange outflow. The stand has, however, been contested and the company has been asked to substantiate its claim of break-even in foreign exchange outflow at 42 per cent export level.

The local manufacturers of nylon cord in the country, who manufacture

nylon-6 variety, have been vigorously agitating against the grant of permission to this project. According to their calculations, the forex outflow for the project will be balanced only at 70 per cent export levels, a view which has been supported by certain quarters in the Government also.

The variance in the estimates of different parties is because of the different estimates being made by them on the demand and availability of caprolactum, the raw material for nylon-6. Thapar-Du Pont claim that caprolactum will continue to be in shortage and 50 per cent of it will have to be imported. The opponents of the project point out that India will have sufficient capacities in this raw material by 1992.

While at present the demand for caprolactum is 75,000 tonnes per annum, this is likely to rise to about 1,27,000 tonnes per annum by 1995 according to an estimate made by the S.B. Billimoria and Co. for one of their clients.

Compared to this, the capacity for manufacturing it is slated to grow to 1,70,000 tonnes per annum with FACT, GSFC and BSIDC implementing their respective plans. Therefore, the claims of caprolactum shortage can be questioned by various observers, and consequently calculations based on such an assumption also become suspect.

Another factor which has gone against the Du Pont project is the selection of nylon-6 by the leading tyre manufacturers for their own production. In the applications made by Modis, Dunlop and Ceat the choice of nylon has clearly been indicated as nylon-6 rather than nylon-66. This has considerably weakened the case for Thapar Du-Pont.

However, in spite of all the factors going against the Du Pont proposal and the intense controversy the case is generating in the industry circles, the Government is likely to give its nod to the project very shortly. This is likely to

raise many an eyebrow and the next question is, "Is the Government ready to sacrifice the indigenous industry to please uncle Sam?"

### PARACETAMOL PRICES SCALE NEW PEAK

The price of paracetamol, the 100% harmful among popular painkillers, touched a peak of Rs. 150 a kg, to the international price. The abnormal price increase is attributed to short supply and consequently inflated open market price of paranitrochlorobenzene (PNCB), the main input. The prices of other raw materials like iron powder, sulphuric acid and caustic soda have also spurted in recent months.

A leading producer said that nine units are operating around 30 per cent capacity due to shortage of raw materials. As a result, the entire fixed costs and overheads are loaded on the reduced capacity, he said. The situation is slowing down India out of the analgesics export market. Exporters say that China, which is offering the material at \$4.40 a kg (Rs. 75), has gained a foothold in markets earlier served by Indian units.

The leading Indian producer, PNCB is Hindustan Organic Chemicals Ltd., (HOC). According to HOC, many exporters who hitherto used to import PNCB against advance licence are now pressing for indigenous material.

### GARWARE PLANS POLYPROPYLENE FIBRE UNIT

Garware Wallropes Ltd., plans to set up a plant to produce 2,000 tonnes of polypropylene staple fibre in Chinchwad, near Pune. Polypropylene fibre is a versatile product which finds applications in non-woven fabrics, industrial filters, mattresses and the like. Though some tyres of non-wovens are made in the country, those of superior quality (like the ones used in "peel-off" sanitary napkins) continue to be imported.

There is only one unit in the country making polypropylene fibre using obsolete technology and incurring high costs.



## IOCL expansion turned down

The Union Government has turned down the application of Indian Organic Chemicals Ltd. (IOCL) for expansion of its capacity for production of alcohol-based chemicals. Similarly, another application from Gujarat Alkalies and Chemicals Ltd. (GACL) for effecting substantial expansion of capacity for making mix chloromethane, has been rejected.

The IOCL wanted to raise the manufacture of alcohol-based chemicals from 14,700 tpa to 24,00 tpa at its existing location at Khopoli, district Raigad, Maharashtra. Likewise, GACL had applied for permission to raise its capacity for making mix chloromethane, consisting of methyl chloride, methylene chloride, carbon tetrachloride and chloroform, from 16,500 to 21,120 tpa.

In the case of IOCL, the expansion would have cost Rs. 6.65 crores while

for GACL the cost was placed at Rs. 25 crores. According to official sources, IOCL planned to raise the amount through internal accruals and loans from financial institutions and banks coupled with the issue of debentures. As per the proposal, IOCL has planned to raise Rs. 2 crores, from internal accruals and the balance from financial institutions, banks and through debentures.

The GACL, on the other hand, hoped to finance the expansion project by raising Rs. 8.33 crores as internal accruals and the balance from the financial institutions. The IOCL's proposal was rejected on the ground that it had not indicated an assured availability of alcohol for purposes of expansion. Accordingly, the government felt that the proposal did not merit a favourable consideration.

In the case of GACL, the government felt that the Company's proposal

was not in conformity with the locational policy. The Company wanted to undertake the expansion at its existing location at Baroda.

## GSFC PLANS PHOSPHORIC ACID PLANT AT SIKKA

Gujarat State Fertilisers Company Ltd. would be setting up a phosphoric acid plant at Sikka in Jamnagar district, Gujarat shortly. The estimated cost of this project would be about Rs. 300 crores. According to Mr. P.V. Swaminathan, Managing Director of GSFC the company board has already approved the project and the preliminary work has already commenced.

The Company's decision to set up the phosphoric acid plant was due to the inadequate domestic production and the uncertainty of its import. Recently many of the fertiliser plants making diammonium phosphate had to shut down because of phosphoric acid shortage.

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## LEVIES ON INDUSTRIAL ALCOHOL

## SC to decide on State's rights

The Supreme Court is to decide on a petition filed by Synthetics and Chemicals Ltd. questioning the State's right to slap levies other than sales tax on industrial alcohol. Leading alcohol-dependent units all over the country like Chemicals and Plastics India Ltd. (Chemplast) and Hindustan Polymers have joined as co-petitioners in the case whose outcome can alter the fortunes of the alcohol-based industry.

As the issue affects the revenue of States for whom molasses alcohol is a traditional milch cow, notices have been sent to all States. Advocate Generals of Maharashtra and other States were expected to reach New Delhi last week in this connection.

Synthetics and Chemicals, Bareilly, had challenged the competence of the Uttar Pradesh Government to subject industrial alcohol/denatured spirit to the levy of vend fee and other such duties on the ground that denatured

spirit is not covered by entry eight of list two of the Seventh Schedule of the Constitution.

The Company has also contended that after the enactment of Industries (Development and Regulation) Act of 1951, the Union Government had taken all industries covered by the Act, including the fermentation industry, and accordingly, the Union Government alone had the power to regulate the distribution, transport, disposal, acquisition, possession, use or consumption of articles relating to these industries.

Industry sources say it is a question of semantics, a failure of words to change their meanings with changing times. Liquor is a State subject, and States have the power to levy taxes to regulate its consumption in the interest of public health, having defined liquor as anything containing alcohol, industrial (ethyl) alcohol is also construed as coming under the State's purview.

All States have been levying innumerable taxes on industrial alcohol despite the fact that both molasses and ethyl alcohol are governed by Central laws. The price of ethyl alcohol, for example, is notified by the Union Government. The Supreme Court, in its judgment of December 19, 1979, had rejected the contention of Synthetics and Chemicals and upheld the legislative competence of the State Government. Following this, the Company filed an appeal against the order to the Constitution Bench of the same court. The appeal has now come up for hearing.

There was a time when as many as seven taxes were levied on alcohol in Uttar Pradesh. These included, for every litre, Rs. 1.10 vend fee, 21 paise purchase tax, 10 paise licence fee and several paise administrative charges. In 1975 the State notified a composite levy of 25 paise to replace the long list. In addition to the above, several States, including UP are levying "an export fee" on moving the material to another State within India.

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## RECTIFIED SPIRIT

## Lopsided policy hits acetic acid units in Karnataka

Alcohol-based industries in Karnataka, particularly the acetic acid units, have been forced to stop production and lay off workers in the last few months on account of the 'lopsided' policy of the State Government on the allotment of rectified spirit and the stiff dose of 'privilege' fee on rectified spirit.

According to the spokesmen of two of the State's leading acetic acid units, namely, KAP Chem Ltd. and Southern Organics Ltd., the industry has suspended production since March 1989. Repeated representations in the last five months have brought no relief, they say.

According to the spokesmen, the State Government, in March, levied a new 'privilege fee' on rectified spirit at the rate of Rs. 16.28 per bulk litre, thereby increasing the input cost of this raw material used in the manufacture of acetic acid to Rs. 22 per kg. According to them, this is anomalous as the sale price of acetic acid itself is only around Rs. 9 to Rs. 9.50 per kg.

Prior to this levy, the Government had reduced the excise duty on this product to seven paise per litre of alcohol put to industrial use. However, while levying the new fee, the same was not reduced for industrial users, the industry spokesmen complain. According to them, the State Excise Commissioner had assured the industry, following representations, that the new levy would be reduced to seven paise per bulk litre in the case of industrial users. But to this day, the assurance had not been given effect to, they say.

On the other hand, the Government has proposed to increase the privilege fee from five paise earlier to 75 paise per bulk litre of denatured spirit which is non-potable and can only be put to industrial use. According to the acetic industry, this demonstrated the 'adverse

policy' of the State Government on this issue.

Kap Chem has declared lay-off since July 17. Earlier, it had laid off its workers from April 27 to May 8. According to the spokesmen of Kap Chem management and the union, the company had no option but to declare a lay-off on account of the unit's inability to transfer alcohol produced in its captive distillery located in the same premises. They point out that the company, set up at a cost of Rs. 4.50 crores in 1983, had been using the rectified spirit from its captive distillery all these years.

According to the union, about four months ago, the State Excise Commissioner ordered that alcohol could not be transferred from the distillery to the acetic acid plant and on a writ petition challenging this order filed by the man-

agement, the Karnataka High Court had granted a stay. But the Excise Commissioner continued to be 'adamant' and had refused to 'honour' the court orders, the Kap Chem Employees Association has said in a memorandum submitted to the State Governor, Mr. P. Venkatasubbiah. It has sought his intervention to solve this ticklish issue and facilitate the reopening of the factory.

### OIL SLICK: OWNERS TO PAY \$250,000

The owners of the Maltese tanker, m.v. Puppy, have agreed to pay \$250,000 for their alleged involvement in the recent spillage of furnace oil in the Indian Ocean.

According to shipping sources at Bombay, the amount offered was by way of a guarantee as an estimate of the exact compensation desired by the Indian authorities as the extent of damage caused by the spillage was still being assessed.

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## NOTICE

It is hereby notified for the information of the public that National Organic Chemical Industries Limited proposed to give to the Central Government in the Department of Company Affairs, New Delhi, a notice under sub-section (i) of Section 21 of the Monopolies and Restrictive Trade Practices Act, 1969, for substantial expansion of their undertakings.

Brief particulars of the proposal are as under:

1. Name and address of owner of the undertaking: National Organic Chemical Industries Limited, Mafatlal Centre, Nariman Point, Bombay 400 021.
2. Capital structure of the owner organisation: Authorised, issued, subscribed and paid-up capital: Rs. 36 crores divided into 36 lakhs equity shares of Rs. 100 each.
3. Location of the unit or division to be expanded: Plot No. 5, Trans-Thane Creek Industrial Area, Thane-Belapur Road, District Thane, State Maharashtra.
4. In case the expansion relates to the production, storage, supply, distribution, marketing or control of goods, indicate: (i) Names of goods: Organic Heavy Chemicals; (ii) Licensed capacity/turnover: 15,29,200 MT (2,46,600 MT) per annum inclusive of — Ethylene 300,000 (63,000); Propylene 140,000 (37,000); Butadiene 70,000 (7,200); Benzene (and related quantities of toluene, carbon black feedstock and other pyrolysis gasoline return streams) 190,000 (17,000); Ethylene oxide 120,000 (14,000); Ethylene Glycol 125,000 (10,000); Diethylene Glycol 13,000 (700); Polyethylene Glycols 5,000 (1,500); Glycol Ethers 10,000; Isopropanol (2,500); Acetone (14,000); Diacetone Alcohol (2,800); and Methyl Isobutyl Ketone (3,700) 23,000; Butanol (6,000) and 2 Ethyl Hexanol (10,000) 16,000; Polypropylene 100,000; Styrene 50,000; Expandable Polystyrene 20,000; Styrene Butadiene Rubber (SBR) and other Elastomers 100,000; Butene-1 15,000; MTBE 25,000; Methane 2,700 (2,700); Dichloroethane (3,000), Vinyl Chloride (30,000) and Polyvinyl Chloride (21,500) 54,500 and by/co products produced inevitably in the process (e.g. DCPD, CBFS, LPG, Hydrogen, Isoprene and other fuel streams) estimated to be 150,000 MTA. (Figures in brackets indicate capacity before expansion).
5. In case the expansion relates to any service state the extent of expansion in terms of usual measures such as value, turnover, income, etc.: Not applicable.
6. Cost of the Project: Rs. 1832 crores.
7. Scheme of Finance: (a) *Equity*: Share Capital & Premium (Rights, Convertible portion of Convertible Debentures and similar instruments to shareholders/public including Multilateral Agencies) and internal accruals — Rs. 1,112 crores. (b) *Equity-related Debt*: Non-convertible portion of convertible debentures/Non-Convertible Debentures / Other similar instruments — Rs. 720 crores.

**NOTES:** (i) The foreign exchange component of the project estimated at about Rs. 400 crores is included in the above scheme and will be raised from the foreign collaborator. (ii) The existing shareholders of the company as the promoters will contribute not less than Rs. 370 crores being the 20% contribution to the total project cost in the form of rights, convertible debentures and other similar instruments.

Any person interested in the matter may make a representation in quadruplicate to the Secretary, Department of Company Affairs, Government of India, Shastri Bhavan, New Delhi, within 14 days from the date of publication of this notice, intimating his views on the proposal and indicating the nature of his interest therein.

M.S. PATWARDHAN  
Vice-Chairman

Registered Office: Mafatlal Centre, Nariman Point, Bombay 400 021

Dated: 22nd August, 1989

## SUPPLY OF INTERMEDIATE GOODS

# Advance licensing scheme eased

The commerce ministry has liberalised the intermediate advance licensing scheme. Now ultimate exporters, without being manufacturers of the goods but holding the status of export or trading houses, can also avail of the facility of the intermediate scheme. Some changes have also been made in the import policy for registered exporters.

This facility is, however, subject to certain conditions, according to a public notice issued by the chief controller of imports and exports (CCI and E) on August 14. The liberalisation has been effected by adding sub-para 351(4) in the hand book of procedures, relating to duty exemption scheme.

The conditions are: "The applicant export or trading house in its application for the licence declares the name and address of the supporting manufacturer who will receive the intermediate goods supplied by the intermediate manufacturer for conversion into the ultimate export product, for inclusion in the duty exemption entitlement certificate (DEEC) or the import-export pass book; and the intermediate goods are moved from the factory of the intermediate manufacturer directly to the factory of the declared supporting manufacturer under usual Central excise gate passes and appropriate records of their receipts and their consumption are maintained by the intermediate manufacturer.

The amendments in the import policy for registered exporters have been made in Import-Export Policy (Volume I) through a public notice issued by the CCI and E on August 11. Sub-para (3) of para 186 has been amended to read as:

(a) In respect of export products where there are changes either in the rates of the items of import replenishment during the policy period, the registered exporters of such export products will have the option to claim rep licences either based on the rate and the items of import replenishment in force

prior to the change, or based on the rate and items of import replenishment amended in respect of exports effected during the period of 90 days from date of such amendment; and

(b) Notwithstanding anything contained in the above para, the transition period of 90 days may be restricted to 30 days in case where it is so deemed by the government, in the larger public interest.

## \$10 M US GRANT FOR BANGALORE TECH. DEVELOPMENT CENTRE

The United States has announced a \$ ten million grant for the Bangalore based Centre for Technology Development for a project to develop and improve India's technology infrastructure. The grant agreement was announced at New Delhi on August 14 by the U.S. ambassador John R. Harbard who said the project is directed at accelerating the pace and quality of technology development and at supporting the growth of commercial applications of technology.

The agreement was signed recently by N. Vaghul, chairman and managing director, Industrial Credit and Investment Corporation of India Limited, Bombay (ICICI), and Robert Bakley, director, U.S. Agency for International Development, India. Using a regionally-based strategy, the CTD will serve as a forum through which leaders from business, financial institutions, government, and academia can work to strengthen the existing technological infrastructure.

Efforts to increase the region's ability to use technology to develop products and to improve production processes will be made in response to business demands. The centre's work will emphasise applied technology centres, human resource development, and satellite-based technical information changes.





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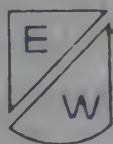
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## Burroughs Wellcome to import kits from parent company

Burroughs Wellcome (India) Ltd. plans to import diagnostic kits, including AIDS test kits, as well as vaccines, manufactured by the parent company. An acute shortage of AIDS test kits has led to a ban on the manufacture of blood products in the country. The Indian Council for Medical Research used to import Wellcome kits through the World Health Organisation which later discontinued supplies. Import of similar kits from a West German firm was given up following a controversy over quality.

The Indian unit is also gearing up to launch two new drugs, both Wellcome discoveries, by the year-end. One is acyclovir (for the treatment of herpes infections) and the other, atracurim injection, an advanced muscle relaxant. To begin with, the Company proposes to import formulations, before taking up indigenous production. However, the 1979 DPCO provision (which has not been revised later) allows only 50 per cent mark-up on imported formulations, "which is inadequate to cover even the distribution cost let alone leave a margin for the importer", according to Mr. Keith Gay, company chairman.

He has suggested that the Government notify a separate manufacturer's price, in addition to the maximum retail price now in force. "The trade should be free to put up their mark-up on the product subject to the maximum retail price. Any increase in the manufacturers' price or the trade margin will have to be secured through a mechanism similar to the price approval procedure laid down in the DPCO" he said. This will help the producer and distributor alike as also "eliminate the major area of perennial conflict and confrontation between the manufacturer and the trade" he suggested.

Because of tardy implementation of price revision as per the 1987 DPCO,

the "industry continued to be caught between virtually frozen prices on the one hand and escalating costs on the other", Mr. Gay said. The result is that profitability, which plummeted sharply last year, shows only a marginal improvement this year. In decontrolled category, although in theory, producers are free to adjust prices to neutralise cost increases, at the intervention of the Government, prices have to be arbitrarily reduced, he noted.

At the same time, there is a genuine desire to liberalise controls on the part of the Government, according to Mr. D.K. Bose, President and Managing Director. He quoted a study made by the Organisation of Pharmaceutical Producers of India (OPPI) which shows that the lion's share of the price increases effected as a result of the latest DPCO goes to the Government and the trade, with the "rabbit's share" going to the producer.

This contradicts the basic objective of DPCO, which is to encourage manufacturers to invest more. Several new formulations in the nature of line extensions are under development.

### CHEMICALS IMPORT TO BE FURTHER RESTRICTED

Indigenously available chemicals now in Appendix three of the import-export policy may be shifted to appendix two to restrict unnecessary imports, Mr. H.C. Gandhi, Secretary and Director General of Technical Development in the Industry Ministry said.

Responding to the demand made by the Indian Chemical Auxiliaries Manufacturers Association (ICAMA), Mr. Gandhi said this could be done "wherever there is a strong indigenous angle". The ICAMA President, Mr. S.K. Parekh, told the annual general meeting on August 18 that many finished pro-

ducts under the guise of raw materials are being imported against advance licence. These duty-free goods, he alleged, enter the domestic market, affecting the sales of indigenously made surfactants based on EO, LAB and other alcohols, silicone emulsions, PVC, plasticisers and the like.

Mr. Gandhi commended the impressive performance of chemicals which recorded a 12.8 per cent growth more than that of most industries. A committee has been set up to study the export prospects of textile auxiliaries, which are not doing well on the export front. The committee headed by Mr. M.D. Dhamankar, past President of ICAMA, is to submit its report in a month.

Mr. Gandhi and Prof. M.M. Sharma of the Bombay University's Department of Chemical Technology, spoke of the vast scope for textile auxiliaries and speciality chemicals. Though spin finishes for man-made fibres are now made in India, special finishes for water jet looms continue to be imported.

In this field as well as in leather chemicals, Indian units should catch up with the latest developments in the West, Mr. Gandhi said.

### PLASTIC PARTS FOR CARS OF THE FUTURE

The automobile and aerospace industries of the future may be using high-performance plastics and carbon fibre-based composites in place of metal on manufacturing assembly lines, according to the World Future Society, a U.S. nonprofit scientific and educational association. Many automobiles already have plastic body parts, and fine light-weight ceramics are being used increasingly in engines to boost fuel efficiency. The new materials are light, never wear out, and they can withstand very high temperatures, say researchers. The fuel-efficient ceramic parts are also ideal for use in the manufacture of aeroplanes.



## Forty per cent limit on foreign equity should go: Abid Hussain

The Foreign Exchange Regulation Act (FERA) should be scrapped and replaced by a simple but liberal policy which would "promote" rather than "permit" foreign investment into India, Mr. Abid Hussain, planning commission member said. Outlining what the new policy should be, Mr. Abid Hussain said the single biggest bottleneck to attracting foreign investments was the "forty per cent law". The control limit should be redefined to anything beyond 50 per cent and a foreign company should be defined as one company having 51 per cent foreign equity or more. In such cases export of goods and services to balance the increased remittance could be insisted upon.

Mr. Abid Hussain who was inaugurating a seminar on "Indian industry: looking ahead", organised by United Writers Association at Madras, said foreign investments would not only bring in foreign savings to meet resource gaps but also bring in technology, skills and expertise.

Foreign investment was one area where India had so far been "conservative" to its disadvantage. Since technology and technological innovation would be the pivots around which the next phase of industrial development should revolve, there was a strong case for attracting foreign investments.

Due to "conservatism in the past, India had lost out and was losing out in the great game of international capital and technology flows. "Our policies towards foreign capital are outdated and do not reflect the technological strength that the Indian industry had been able to acquire over the past few years."

With suitable reforms to the existing policies on foreign investments, India would be in a position to attract at least 600 to 700 million dollars of foreign investment every year by the end of the Eighth Plan. Foreign investment was far better than commercial borrowings. It was the most effective non-debt creating form of capital flow. Its servicing

takes place only when there was productive economic activity, unlike debt.

Mr. Abid Hussain said alongside regulations pertaining to foreign investments, India should follow a parallel track and target specific companies and woo them aggressively for the technology and the skills they have developed and possess. It was more important to have firm specific policies and get companies which have the technology to operate in India.

He said that fears that foreign capital could destabilise the country were unfounded. India was not a banana republic and in any case economic and political destabilisation came not from foreign capital but from local "Mirjafars". Countries such as China, Vietnam and Soviet Union, which are more socialist than India were attracting foreign investments. "We must realise that we are in a competitive game". It was not as if foreign investors were waiting in a queue to come to India. The sad truth was that nobody really wanted to come to India. "We have a terrible image problem and more than that our bureaucracy is enough to turn even the most patient of people away", Mr. Abid Hussain said and added that time for marginal tinkering, a bit of change here and there was over.

Mr. Abid Hussain also spoke about the scope for privatisation, capital market reform and efficiency of investment. He was in favour of privatisation at least to get the "bureaucracy off economic activities and Government off people's banks and out of their pockets". The attraction of privatisation was that it would get the "babu" and the "neta" out of the mainstream of economic activity and confine them to the periphery.

Privatisation did not mean promoting the interests of the type of industrial barons who have destroyed Indian jute and textile industries. Privatisation was sheer economic necessity of the need to focus and concentrate public investments and budgetary resource in key

areas of social and physical infrastructure. Referring to capital market forms, Mr. Abid Hussain said capital market should be made more investment oriented rather than banker-oriented. The dependence of the private corporate sector on public financial institutions for funds should be minimised as also its heavy reliance on debt instruments such as debentures and corporate deposits instead of equity financing.

Mr. Abid Hussain also called for rationalisation of the interest rate structure for efficient mobilisation and allocation of funds in the capital market. This should be achieved by a reduction in the categories of interest rates, integration of interest rate structure to reflect risk, maturity and liquidity and the minimising of differences in effective interest rate on different assets.

### NOBEL CHEMICALS ACQUIRES CHEMICALS COMPANY IN ITALY

Nobel Chemicals AB, belonging to Nobel Industries Sweden AB, has acquired the Italian chemicals company Industria Chimica Profarmaco S.p.A. The company is located outside Milan and it will now provide an opening for Nobel Chemical's expansion plans in the international ethical and general pharmaceutical substance market. The plans include increased production in Sweden and a bigger share of the market via a greater range of products resulting from the purchase of companies.

Nobel Chemicals represents the pharmaceutical business area within Nobel Industries, the dominating chemical group of companies in Scandinavia. This is the second Italian company to be acquired, Blaschim S.p.A., already having been incorporated. Profarmaco has 180 employees and sales total SEK 155 million in 1988. The company develops, manufactures and markets over 70 bulk pharmaceuticals. Approximately 40% of sales are to the US market. This acquisition provides synergistic effects and complements the technology base for the activities of Nobel Chemicals in Karlskoga, Sweden.



## CIL evolving new strategy to export coal

Coal India Limited has decided to chalk out a new strategy for exporting coal which includes developing mines for export purposes only. While some of the mines have been identified, others are in the process of being identified. Certain quantities of washed coking coal are also proposed to be exported since there has been a heavy build-up of these stocks due to inadequate off-take by the steel plants.

Coal India has already concluded a contract for export of 1.3 lakh tonnes of coal to Bangladesh buyers. Another memorandum of understanding had also been signed with the government of Bangladesh for export of 1.3 lakh tonnes of coal. A target of export of five lakh tonnes of coal has been set for this year.

For the first time, export supplies to Bangladesh are being made through river transport from Calcutta. The rail transport capacity via Gede border has been found to be inadequate. Coal India also wants railways to increase their capacity to transport coal to Bangladesh through border stations like Benapole abandoned earlier. This has become necessary since the Haldia port has reached the saturation point.

Coal India wants to clear the stocks of washed coking coal to keep up the tempo of production during the peak period. During January-March 1989 substantial quantity of washed coking coal was dumped by the washeries for want demand. Washeries of Central Coalfields dumped more than 1.5 lakh tonnes of coal during January-March 1989. Swang and Gidi washeries had to stop production due to lack of dumping space. Ground dumping of clean coal by the mines of Bharat Coking Coal Limited was also substantial during the period.

The total pithead stocks of coal with Coal India at the end of June this year stood at about 39 million tonnes which

is considered to be very high. The pithead stocks came down marginally thereafter due to production not keeping pace with the targets.

However, it is felt that Coal India may have to cut down its production towards the end of the year to tackle the problem of very high stocks. At present it has plans only to regulate production of certain mines through the overall production target for the year has not been lowered.

### IDPL TO CLOSE SALES OFFICE IN CALCUTTA

The Indian Drugs and Pharmaceuticals Limited (IDPL) has decided to close down its sales office in Calcutta following trouble with employees of that office.

Mr. K. Venkataramanan, chairman and managing director of the public

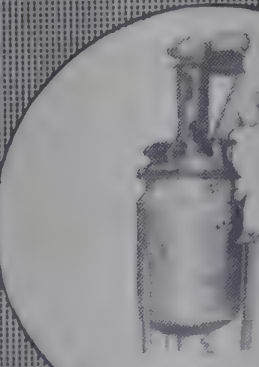
sector company told newsmen at New Delhi on August 22, that the management had declared a lockout with effect from August 20. He blamed the West Bengal government for its inability to provide protection to the IDPL management.

"The ever increasing apprehension of attack of personnel, property of IDPL and the lack of positive government action to provide the necessary protection left the IDPL management with no choice but to declare a lock-out", he said.

The employees working in that office will be offered employment in sales offices in other states. He said the company was making efforts to supply life saving drugs from adjoining states for the people in West Bengal.

Mr. Venkataramanan said it was decided to transfer 22 medical representatives who were not doing well to other offices.

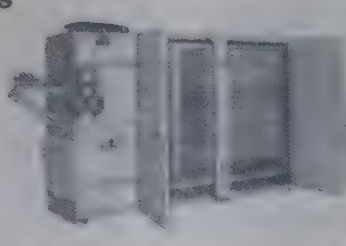
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## SHIFT LIKELY IN PLAN FUNDS ALLOCATION POLICY

### Heavy industries to be off priority list

A significant, if not total, departure from the Nehruvian model of development will be the main thrust of the Eighth Plan (1990-91 to 1994-95) now in an advanced stage of drafting by the Planning Commission. According to reliable sources in the Yojana Bhawan, the allocation of the public sector outlay to the heavy industries would be scaled down drastically. The so-called building blocks of the economy — steel, aluminium, copper, oil refineries, petrochemicals, heavy engineering, fertilisers — would be asked to fend for their own resources.

A full meeting of the Planning Commission was held on August 26 with the Prime Minister presiding to examine the whole set of new issues for development. Agriculture, irrigation and productive employment generation programmes will get the highest priority in the allocation of public sector outlay. There is likely to be a strategic shift in the allocation of State resources from the sectors with high incremental capital output ratio (ICOR) (capital required to produce an additional unit of output) like heavy industries to low ICOR sectors like agriculture and irrigation.

This would be a major departure from the policies followed in the past in which heavy industries got the major chunk of the public sector outlay. Even in the Seventh Plan 63% of the total public sector Plan outlay was allocated for the heavy industries. Agriculture, rural development, irrigation, human resource development received just about 26% of the outlay. The share of the latter is expected to be doubled in the Eighth Plan.

It is expected that such a change in the policy will in the long run, squeeze out many of the heavy industries from the public sector to the private sector. This will be more in line with the lib-

eralisation policy that the Centre has been following in the eighties. The policy of liberalisation would, in fact be expanded further by rationalising and reducing tariffs. In the Eighth Plan, the main thrust would be to bring in more competition, remove control from both the public and private sectors. The role of the private sector in power generation, fertilisers, petrochemicals and refineries is expected to go up. A policy decision is understood to have been taken by the Planning Commission to stop any further setting up of any public sector power plants for power-intensive industries.

The priority for additional power generating capacity, would shift to agriculture, irrigation and for catering to the needs of rural households. It is expected that the public sector outlay on wasteland reclamation, soil conservation, education, health and family welfare, sericulture, fishing and on the construction of all-weather rural roads will go up.

In a nutshell, an attempt is being made to shift the public sector investment from high ICOR industries to sectors with low ICOR sectors. This will lead to an overall decline in the ICOR at least in the public sector. The Eighth Plan, according to these sources, will aim for a higher growth rate for agriculture, construction and communication. But the largest contribution to the value added would be from the manufacturing sector. This implies that in the Eighth Plan there will be an attempt to privatise some of the crucial industries.

#### UCIL CHEMBUR HANDED OVER TO OSWAL

Union Carbide India Limited (UCIL) handed over its chemicals and plastics undertaking at Chembur, Bombay to the Oswal Agro Mills (OAML) on August 21, having received all statutory approv-

als from the authorities and full consideration of Rs. 58.5 crores from OAMI. Mr. V.P. Gokhale, UCIL's Chairman and Managing Director, said 'We are happy that after a long period of uncertainty this unit will now restart, ensuring continuity of service and protecting terms of employment for the employees.'

As per the terms of the sale agreement all the 781 employees of the undertaking will continue their employment on terms no less favourable than those which they enjoy with UCIL, without the interruption of service. Oswal Agro Mills Limited has taken full responsibility for all the employment benefits.

The net proceeds from the sale of the undertaking will be utilised, subject to the approval of the Reserve Bank of India, to repay the temporary advance taken from the State Bank of India for payment made into the Supreme Court of India in February 1989 arising from the Bhopal litigation.

Meanwhile, the ongoing businesses of UCIL, viz. batteries, flashlights, carbons and metals, continue from its 10 factories and 13 branches, engaging nearly 7,000 employees throughout the country. UCIL is pursuing measures of modernisation and profitability improvement of these operations, says a UCIL press release.

#### AIMO PLEA

The Tamil Nadu unit of the All-India Manufacturers' Organisation (AIMO) urged the State Government to extend the incentive package announced for new small scale units to existing units in urban agglomeration.

Welcoming the new package announced by the Government AIMO Chairman, Mr. K.R. Motilal said if the small units should fully benefit from the scheme, the Government should ensure uninterrupted power supply to them.



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## UPSIDC to launch PUSL project

The U.P. State Industrial Development Corporation (UPSIDC) is setting up an industrial project for the manufacture of Polyurethane Synthetic Leather (PUSL), first of its kind in the State, with a capital outlay of Rs. 900 lakhs in the joint sector. A Memorandum of Understanding (MoU) was signed recently between the UPSIDC and A.E.C. (India) Ltd., New Delhi for establishing the project. It has a licenced capacity of 2.4 million metres per annum of PUSL to be located at Jainpur industrial area in Kanpur Dehat, a zero-industry district.

The UPSIDC holds a letter of intent since March 1986 for setting up the project but its implementation was delayed for want of a suitable collaborator with the required expertise and industrial background. Meantime, the project cost over the years has escalated from Rs. 300 lakhs to Rs. 900 lakhs due to a sharp rise in cost of the sophisticated imported plant and machinery.

It was learnt that the Union Ministry for industrial development had issued as many as 13 letters of intent with a total licenced capacity of 22 million metres per annum of PUSL to bridge the gap between demand and supply, which was expected to widen to 26.84 million metres by 1995-96. At present there is only one unit, Bhor Industries Ltd.,

Bombay, possessing a licensed capacity of 12 million metres per annum, which has started commercial production. Its capacity utilisation was assessed to be around 50-60%. Besides, Lupin Laboratories was implementing another PUSL project with a licenced capacity of two million metres per annum.

The product has a ready market within the country as the supply of natural leather has been declining and it possesses an export potential as well. The main uses of the PUSL are in shoe uppers, sandles and chappals, garments, travel bags, hand bags, vehicle and furniture, upholstery, fancy goods, industrial leather goods and harness and saddlery.

According to recent studies, made by the consultants, the estimated demand for PUSL in the footwear sector was expected to rise to about 25 million metre length and in fancy goods sector by about 5 million metre length by the end of the current financial year. Thus there was a demand-supply gap of 20.37 million metres. The UPSIDC Managing Director Mr. Lalit Srivastava, said that the technology for the project was likely to be acquired from Italy, Yugoslavia or Japan. Already offers for technical collaboration had been received from Italy and Yugoslavia. He said that the main plant and machinery would be imported

while the accessories and other equipments would be indigenous.

The UPSIDC was expected to invest a sum of Rs. 71.5 lakhs and the promoter's contribution was placed Rs. 68.75 lakhs. The remaining cost of the project was to be met by term loan of Rs. 600 lakhs, public issue Rs. 134.75 lakhs and the remaining Rs. 25 lakhs would come as Central capital subsidy.

### FDA RECOGNITION LIKELY FOR SHELLAC, WAX

The Food and Drug Administration of the US has proposed to affirm that shellac and shellac wax be generally recognised as safe for use as direct human food ingredients. The safety of these ingredients has been evaluated under a comprehensive safety review by the agency. The US Shellac Importers Association and Shellac Promoters Council (Ministry of Commerce, Government of India) had co-sponsored a study in America that was required by FDA for investigation purposes. According to American systems, comments are submitted by Sept. 25, 1989 and if adverse comments are received, the recommendation would be acceptable. The acceptance of shellac for use as direct human food ingredient in America is likely to have tremendous impact on users of shellac all over the world.

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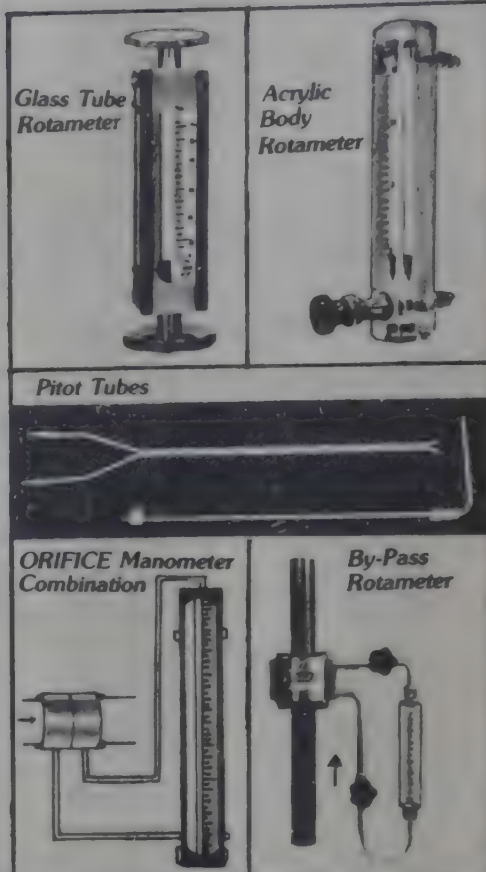
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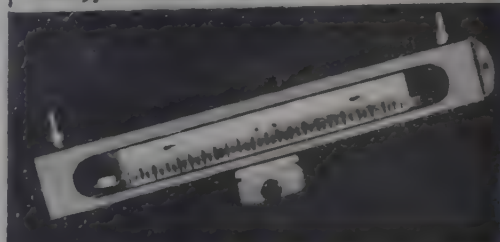
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## Company Notes

### ADARSH CHEMICALS & FERTILISERS LIMITED

The directors of Adarsh Chemicals & Fertilisers Limited have recommended higher Equity Dividend at 15% for 1988-89 as compared to 10% for the fifteen months financial year ended on 31.3.88. The Directors reported gross profit of Rs. 293.07 lakhs net of interest (Rs. 74.68 lakhs). The turnover of Rs. 1,853.74 lakhs is higher by 51%. The percentage of gross profit to the turnover for the year works out to 8.81% (6.13%). The profit left after depreciation is Rs. 247.44 lakhs (Rs. 22.91 lakhs).

After deducting investment allowance reserve of Rs. 3 lakhs (Rs. nil) and prior year adjustments of (-) Rs. 11.32 lakhs ((-) Rs. 5.02 lakhs) deducting tax provision of Rs. 124.55 lakhs (Rs. 2.85 lakhs) including Rs. 9.65 lakhs for previous years, the net profit works out substantially higher at Rs. 108.57 lakhs (Rs. 15.04 lakhs).

The fertiliser division of the company has come out of the spectre of three consecutive years of drought and reported increased production and sale of single superphosphate fertiliser by 54% and 55% respectively as compared to the previous fifteen months year. The company has also sold about 4,325 tonnes of sulphuric acid and oleum as compared to 268 tonnes of sulphuric acid last year. The production and sale of maleic anhydride was reported higher by 18% and 14% respectively compared to April 1987 to March 1988 period.

The directors also reported substantial progress made in putting up a new maleic anhydride plant which incorporates the latest state of the art energy efficient technology supplied by the world renowned scientific design company, U.S.A. For the project being put up at a capital outlay of Rs. 1,697 lakhs, the financial institutions have sanctioned

the required rupee and foreign currency loans. An amount of Rs. 185 lakhs has already been spent by the company.

The company is also coming out with a very attractive rights equity issue in the proportion as liberal as 1:1 and the premium of only Rs. 25 per share of Rs. 100 to part finance the project. The book value of the equity share is Rs. 295 and earning per share is Rs. 63 as on 31.3.89. Even after the rights issue, the equity capital of the company will be only Rs. 352 lakhs as against the reserves of Rs. 336 lakhs as on 31.3.89 and share premium of Rs. 45 lakhs. The record date for the rights entitlement is 29th September, 1989. (Bracketed figures are for the fifteen months financial year 1987-88.)

### DOMINION CHEMICAL UNIT OPENED

Dominion Chemical's new formulation unit — an associate company of the UB group — was inaugurated on August 18 by UB Group Chairman Mr. Vijay Mallya, at Bommanahalli, on Hosur road. Mr. Mallya said the new unit has been set up surpassing the GMP standards prescribed by the World Health Organisation (WHO) with facilities for manufacturing liquid orals, ointments, capsules and tablets. The unit has a capacity for manufacturing a million tablets per day on a single shift basis.

He said that in 1988 Dominion Chemicals entered into an agreement with Fine of Milan, Italy, who are world leaders in research and marketing of cyto-toxic (anti-cancer) drugs, to market in India their much sought after products and also to manufacture their anti-malarials, speciality drugs for cerebral disorders and some of the latest antibiotics. Dominion in collaboration with Hoechst launched the first generation cephalosporin-omnatax — a life saving antibiotic intravenous injection during 1987.

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### THIRUMALAI CHEMICALS

The directors of Thirumalai Chemicals have recommended a final dividend of 15% for the 15 months period ended March 1989, which together with 15% interim dividend already paid makes a total of 30% for the period against 20% paid for 1987. On an annualised basis, this works out to 24%. During the period, on a sale of Rs. 44.5 crores against Rs. 32.15 crores and other income of Rs. 88 lakhs against Rs. 33 lakhs, the company earned a gross profit of Rs. 718 lakhs against Rs. 532 lakhs.

After depreciation (Rs. 251 lakhs against Rs. 400 lakhs), and taxation (Rs. 74 lakhs against Rs. 18 lakhs), and after some adjustments the net profit amounted to Rs. 394 lakhs against Rs. 95 lakhs. The dividend will absorb Rs. 60 lakhs against Rs. 40 lakhs. Rs. 283 lakhs against Rs. 50 lakhs has been transferred to investment allowance reserve and the balance of Rs. 51 lakhs against Rs. 5 lakhs added to the general reserve.

During the period, the Company produced 23,734 (18,274 tonnes) phthalic anhydride and 761 tonnes (136 tonnes) of maleic anhydride. Sales during the period were 22,227 tonnes (16,682) and 709 tonnes respectively. The Company exported during the period 7,924 tonnes (3,184 tonnes) of phthalic anhydride and earned a foreign exchange equivalent to Rs. 701 lakhs against Rs. 223 lakhs. The implementation of the project for the manufacture of maleic anhydride with a capacity of 10,000 tpa is progressing satisfactorily. All Govt. approvals have been obtained and licences for importing capital goods have been received.

### BAYER (INDIA)

Bayer (India), which achieved a 45% higher turnover at Rs. 162.3 crores for the 15-month period ended March, 1989 over the previous 12 months is doing

well in the current year. During the four months from April-July 1989, Company's sales are over Rs. crores registering a 15% increase over the corresponding period in 1988. According to Mr. R.P. Goenka, Chairman the Company is expected to do reasonably well during the current year. The Company has started production of sulphonamides accelerators in mod pellet form since February, 1989. It has also secured the Government's clearance to formulate methyl parathion insecticide at Himmatnagar in Gujarat and project is under implementation.

### UDAIPUR PHOSPHATES

Udaipur Phosphates and Fertilisers, which did well during the 15 months ended March, 1989 and announced equity dividend of Rs. 2 per share, reported satisfactory progress in the current year. According to Mr. R. Goculdas, Chairman, during the 15 months ended July 1989, production of single superphosphate and phosphoric acid have surpassed the performance of the corresponding period of last year. The production of single superphosphate has been 28,301 tonnes against 22,456 tonnes and that of phosphoric acid has been 11,580 tonnes (7,660) tonnes in the current year. Total sales in the four months of the current year is above Rs. 7.6 crores as against Rs. 3.6 crores during the corresponding period last year. The result would lead to better profits this year.

In the light of the experience during drought years, the Company has decided to increase the sale of chemicals as much as possible. The Company had set up facilities for manufacture of oleum. This is already in operation. On account of the debottlenecking of sulphuric acid and superphosphate plants, From June this year the Company has increased its sulphuric acid manufacturing capacity to 41,000 tonnes and supersulphate to 82,500 tonnes which is an increase of 25% of Company's licenced capacity.



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**Product :** Alkaloids and Fine Chemicals

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Contd. See Next Page ➡➡



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**Product :** Chlorinated Compounds, Fine and Pharmaceutical Compounds

**Details of properties :** Land adms. 704 Sq. Mtrs. alongwith Factory Building and other super structure standing thereon and machineries such as M.S. Reactions Vessels, Reflux-Condensor, HCL Scrubber, Chilling Plant, Crystallising Vats, Centrifuge Baskets, Storage Tank, Reactor, Cooling Tower, etc.

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### (12) M/S AURA ENTERPRISE CORPORATION

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**Product :** Shampoo

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### (13) M/S FRIENDS DYES & CHEMICALS

**Location :** C 1/B Type Shed No. 48, GIDC Industrial Estate, Vapi, Dist. Valsad.

**Product :** Dyes, Chemicals and Intermediates.

**Details of properties :** Land admeas. 703 Sq. Mtrs. alongwith built-up area of 1800 Sq. fts. (approx) and machineries such as Boiler, Sulfonators, Drawing vessel, Wooden filter press, Vacuum Pump, Wooden Nutch, Centrifugal Pump Air Compressor, Chilled Water Plant Measuring Vessel etc.

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**Product :** Dyestuffs and Dyes Intermediate

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### (17) M/S SUPER BOARDS INDUSTRIES

**Location :** C-1 Type Shed No. 52, G.I.D.C. Estate, Vapi, Dist. Valsad

**Product :** Leather Board

**Details of properties :** Land adms. 836 Sq. Mtrs. bearing Survey No. 236/P at Plot No. 562 alongwith factory building and office building and other super structure standing thereon and machineries such as Fiberishing Machine, Hydraulic Press, Calander Machine, Shearing Machine, Knife Grinder, Wooden Vate, Water Pump with motor, Hollender Beater Roll, Arc Welding transformer, Drill Machine, Lathe Machine, Transformer etc.

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### Terms and Conditions for Sale of the Property :

1. The properties mortgaged / hypothecated to the Corporation are offered for sale on "As is where is" basis. The offerer should quote separately for (1) Land and Building and (2) Plant and Machineries etc.
2. The persons interested in purchasing the properties may send their offers in sealed covers (Superscribing the name of the Unit at the top) along with a Demand Draft of Rs. 10,000 drawn in favour of "GUJARAT STATE FINANCIAL CORPORATION, AHMEDABAD" being the earnest money to the Dy. General Manager (Recovery) - I, Gujarat State Financial Corporation, Navjivan Trust Building, 2nd Floor, Behind Gujarat Vidyapith, Ashram Road, Ahmedabad - 380 014, so as to reach him on or before 27-9-1989 up to 5.00 p.m.
3. The proposal not accompanied by Demand Draft of the requisite amount of the earnest money, may be rejected.
4. The Corporation reserves the right to change the terms and conditions of sale without any notice.
5. The Corporation reserves the right to accept any offer or to reject all or any of them, without assigning any reason. Corporation may call for open bid amongst the offerers on the day of opening of the offers or thereafter.
6. The offers so received will be opened before the Tender Committee on 28-9-1989 From 12.00 p.m. to 2.00 p.m. for Units Sr. Nos. 1 to 12 & from 2.00 to 3.00 p.m. for Unit Nos. 13 to 17 at GUJARAT STATE FINANCIAL CORPORATION, Navjivan Trust Building, 2nd Floor, Behind Gujarat Vidyapith, Ashram Road, Ahmedabad - 380 014. The offerers are requested to remain present at the time of opening of the offers.

7. On acceptance of offer the purchaser will have to pay minimum 30% of the offer or as may be decided by the Corporation and the balance amount shall be paid within a period of 2-3 years as may be decided by the Corporation. If any payment is not made as per the terms of acceptance of offer then Earnest Money Deposit and payments made pursuant to acceptance of the offer will be forfeited by the Corporation. Offerers should give suitable guarantee acceptable to the Corporation for payment of balance amount with interest @ 16% p.a. gross. However, where the offer is for purchase of machineries only, the offerer has to pay the full amount of the offer accepted as down payment or as may be directed by the Corporation.

8. The outstanding dues of Government / G.I.D.C. against the land/Shed and/or G.E.B. and Municipal / Gram Panchayat Taxes if any, against the property offered for sale, shall be borne by the Purchaser.

9. Purchaser shall bear all legal expenses including stamp duty for the transfer of property.

*The assets offered for sale to be kept open for Inspection the factory site of the Industrial Concerns are as follows*

| Units Sr. No : | Date :    | Time :            |
|----------------|-----------|-------------------|
| 1 to 6         | 12-9-1989 | 12 Noon to 4 P.M. |
| 7 to 12        | 13-9-1989 | 12 Noon to 4 P.M. |
| 13 to 17       | 15-9-1989 | 12 Noon to 4 P.M. |

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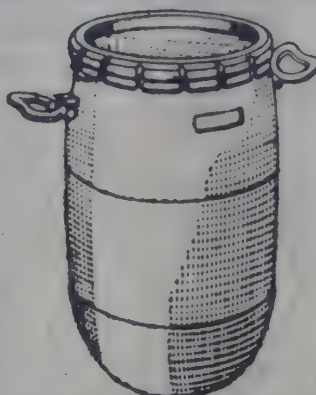
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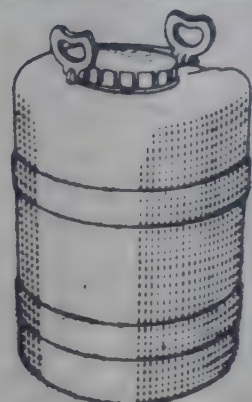
50 Ltrs. Jerry Can



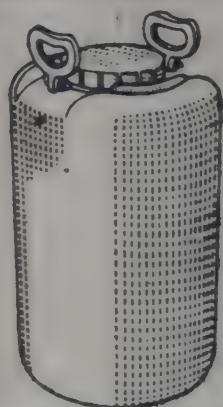
50 Kgs. Round Drum  
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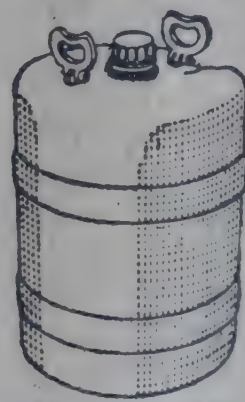
30 Kgs. Round Jar  
— 6" Cap



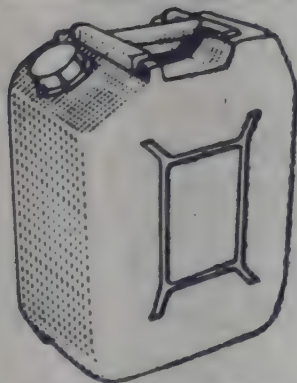
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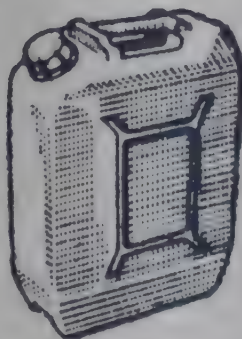
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## MRL mini-refinery in Cauvery basin

Madras Refineries Limited (MRL) proposes to set up a 'mini refinery' in the Cauvery basin with a capacity to process half a million tonnes of crude annually. According to official sources the project when implemented, would produce about 1,33,000 tonnes of kerosene, 1,77,000 tonnes of diesel and 16,500 tonnes of LPG every year. Various products produced in this project except fuel oil and naphtha would be consumed in the same area.

Implementation of this project will result in savings in transport of crude from fields to MRL and of products from MRL to the Cauvery basin area which would have to be incurred if the crude was to be transported to MRL. The project has been conceived in view of the fact that the numerous discoveries in the recent years have established the Cauvery basin as an emerging oil province in the country. The target of oil production by the end of the Seventh Plan (1989-90) is about 0.2 million tonnes. By the end of the Eighth Plan, Oil and Natural Gas Commission (ONGC) has set a target of 1.50 million tonnes annually from the onshore and offshore fields of Cauvery basin. The free and associated gas production potential would by that time reach a level of 1.6 million cubic metres per day.

The Cauvery basin occupying a major part of the Tamil Nadu state is estimated to contain about 540 million tonnes of prognosticated resources of hydrocarbons. Though the search for oil in the Cauvery basins started way back in 1957, the first major breakthrough was achieved only in 1985 when major hydrocarbon strikes were made at Kovilkalappal and Narimanam in the Thanjavur district of Tamil Nadu.

Subsequently oil discovery has also been made at Bhuvanagiri and Nannilam. In the offshore a significant discovery was made at the PY-3 structure in the Porto Novo area in August last year. It is felt that discovery of oil and

gas in Cauvery basin can help Tamil Nadu get over its energy crisis to some extent. The State is presently facing a shortage of power. The availability of gas from the region can transform the power generation scenario in the State.

Already ONGC has committed 40,000 cubic metres of gas per day to be supplied to TNEB for generation of 5 mw of power by the first quarter of 1990-91. TNEB has also registered a demand for the offshore gas to set up a 100 mw power plant at Cuddalore. From Narimanam a commitment of over one lakh cubic metres of gas per day has been made to nine consumers. Gas to the extent of about 14,000 cubic metres per day is already being supplied through the 18-km. pipeline to the various industries located near Nagapattinam. Gas demand to the extent of five million cubic metres per day has also been received by various industries engaged in manufacturing fertilisers, sponge iron, glass, ceramics, textiles, cement and petrochemicals from the Bhuvanagiri area.

### HARRISONS MALAYALAM TO ENTER PETROCHEMICALS

The Guinness-RPG combine steering the course of Harrisons Malayalam Ltd., South India's major plantation outfit, has set its sights higher.

The Rs. 70-crore turnover Harrisons Malayalam, which was in news between July and September last year following the change of ownership of the 40 per cent Sterling stake, is now looking beyond the greenery of its sprawling rubber and tea plantations.

A recent decision of the company's board is to enter the field of petrochemicals in a fairly big way. The project in view is for manufacturing polypropylene, both homo- and co-polymers, at Saidapet in Tamil Nadu. The projected investment is Rs. 275 crores.

The proposal envisages the kind of integration desired by Mr. R.P. Goenka whom Mr. A.J. Guinness of Ambl down Investments of Australia picked up in September last year as the management partner after acquiring the 4 per cent Sterling stake in Harrisons Malayalam in July 1988. The proposed polypropylene project of Harrisons Malayalam automatically gets linked with the Rs. 1,000-crore export-oriented naphtha cracker project which Mr. Goenka wants to set up in Tamil Nadu in technical and financial collaboration with Linde AG of West Germany.

Corporate observers interpret that the Guinness-RPG combination must be working satisfactorily and that Mr. Guinness must be interested in not only retaining its hold on Harrisons Malayalam but also in its expansion. The RPG group is known to have a three per cent stake in the company.

It is widely believed that as part of the understanding, Mr. Guinness will at a later date dis-invest a part of his stake in favour of the RPG group.

The team is apparently trying to assure the shareholders that they can look forward to it to deliver the goods. The board at its last meeting in the third week of July recommended an interim dividend of 25 per cent while taking stock of the company's performance during the 15-month ended June 1988. For the 12-month accounting period ending March 1988, it had paid a dividend of 25 per cent. Enquiries reveal that the management has decided to ensure that the final dividend for the 15-month accounting period reflects the company's satisfactory performance for the period.

The Rs. 10 Harrisons Malayalam scrip has moved between Rs. 70 and Rs. 85 in the last few months, showing a gain of Rs. 12 on levels obtained about a year ago. After the announcement of interim dividend, the scrip moved to Rs. 82 and settled at Rs. 82.



## BID TO HASTEN MERGER WITH MRL

### MPCL seeks BIFR package

In a bid to speed up the process of its merger with the public sector Madras Refineries Ltd. (MRL), Madras Petrochem Ltd. (MPCL) has gone before the Board for Industrial and Financial Reconstruction (BIFR) seeking a revival package.

The company, formerly Nagpal Ambadi Petro-Chem Refining Ltd., in its application to the Board has sought fresh injection of funds and selection of a sound company to be involved in the operation of its plant at Manali. MPCL has indicated that MRL having close links with the company will be an ideal choice. Its Managing Director is only a nominee of MRL.

As the financial institutions and banks are already in favour of the takeover of MPCL by MRL, BIFR is soon expected to appoint IDBI as an operating agency to prepare a viability report. Meanwhile, IDBI has informed the banks recently that a memorandum of understanding will be reached between MRL and MPCL soon for running the latter's plant by the former.

Highlighting the 'grave situation' facing the company, the management has told the Board that it is starved of working capital even to maintain the

current capacity utilisation of 30 per cent. It has called for immediate relief measures to avert a breakdown, which appears "imminent".

MPCL, which managed to make a cash profit of Rs. 10.84 lakhs during the period 1982-83 to 1985-86, suffered a setback in the subsequent years. While it incurred a cash loss of Rs. 13.90 lakhs in 1986-87 (September 1, 1986 to December 31, 1987), it came to a whopping Rs. 1.50 crores during 1988-89 (January 1, 1988 to March 31, 1989), on a turnover of Rs. 14.30 crores.

Listing the reasons for the setback, the management said despite all efforts, the company has been unable to 'shake off the hangover' resulting from the substantial diversion of funds that took place during the previous management's regime (before August 1978). This has squeezed the working capital availability to MPCL leading to poor capacity utilisation. It owes a staggering Rs. 19 crores to the institutions and banks of which funded interest and the non-operative cash credit alone comes to Rs. 10.69 crores.

Added to this, there is a mismatch between the equity base (Rs. 2.89 crores) and loan funds (Rs. 19 crores),

which leaves no surplus. The plant is also facing shortage in the supply of feedstock from MRL. To ensure its viability, the management has proposed the inclusion of some new lines of production activity with scope for value addition. The plant is now engaged in the manufacture of transformer oil, white mineral oils, petroleum jelly etc.

Apart from injecting a minimum working capital of Rs. 1.5 crores, it has stressed the need to undertake a crash maintenance/rehabilitation programme costing Rs. 1.25 crores in the next two or three years. This, along with waiving a portion of the funded interest (Rs. 4 crores), should enable the company to repay its dues to the institutions and banks by 1995-96.

It has estimated that an additional income of Rs. 1 crore a year will accrue to the company if steps are taken to implement the scheme to upgrade lube distillates available from MRL. There is a delay in executing the scheme although MPCL has spent Rs. 1.1 crores on revamping its ASD plant for the purpose.

Besides, it looks forward to expediting the on-going arbitration proceedings with its sole distributor, appointed by the old management. It has raised a dispute claiming Rs. 14 crores from the distributor including interest charges.

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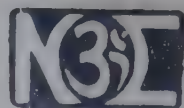
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## Karnal refinery: India may reject Russian offer

India is likely to reject the Soviet offer to build the Karnal refinery on a turnkey basis unless its price is brought down substantially. This follows the Finance Ministry's decision to give only 50% duty relief on imports for the Karnal refinery. The decision would bring down the effective rate of duty from the existing 80% to 40% and project cost from about Rs. 2,700 crores to about Rs. 2,300 crores. A final round of negotiations with the Soviets on their first two offers for Karnal refinery — one of technical assistance basis and the other on turnkey basis — is to be held soon to decide the future of the project. However, a six million-tonne refinery with a capital cost of about Rs. 2,300 crores is not considered to be a viable proposition. It is felt that the refinery should not cost more than Rs. 1,600 crores. The first attempt would, therefore, be to negotiate with the Soviets to bring down their price.

The Soviet organisation Techmashimport had made an offer on technical assistance basis in July 1988 and on turnkey basis in November 1988. A revised turnkey offer was made in May 1989. The main reason for the Soviet offer to become so expensive is considered to be its heavy reliance on western companies for supply of technology and equipment. The revised Soviet turnkey offer includes supply of hydrocracker technology by UOP, hydrogen technology by Haldor Topsoe, engineering by Snamprogetti and distributed digital control system to be financed from free foreign exchange for which no techno-economic justification has been given to Indians.

However, it seems unlikely that the Soviets will be able to bring down their offer by Rs. 700 crores to Rs. 800 crores as is being sought by the Indians. The Indian Oil Corporation (IOC) is confident of constructing the refinery at a cost of about Rs. 1,600 crores

by maximising the indigenous content as it has done in the case of the Koyali refinery. For Koyali, IOC had a tie up with Chervon for hydrocracker technology and with Engineers India Limited (EIL) for certain other services.

Tatas, who have signed a memorandum of understanding with IOC for a joint venture company to take up the Karnal refinery, will also have to decide how to go about the project. At one stage, Tatas were reported to be having second thoughts about their participation in the Karnal refinery. However, this was denied by them. Various issues arising out of the Finance Ministry's decision to give only 50% duty relief on imports for the Karnal refinery and the high cost of Soviet technology are understood to have been discussed by Mr. Darbari Seth, Chairman, Tata Chemicals, with senior officials of the Petroleum Ministry in New Delhi recently.

Though the outcome of the meeting is not known, it is clear the price offer of the Soviets is considered to be exorbitantly high and will make the project unviable. If the Soviets are unable to bring down the price of their turnkey offer, it is possible that the project may be taken up with Soviet credit assistance only. The Soviets had offered a credit of Rs. 500-600 crores for the project. Depending on the Soviet response, the Tatas will have to decide on the extent of their resource commitment for the project. So far as IOC is concerned, it is confident of implementing the project on its own.

### REIMBURSEMENT DELAY: OIL REFINERIES FACE LIQUIDITY PROBLEM

The Government's decision to make reimbursements to the petroleum refineries for the increase in the cess on crude oil only at the end of the finan-

cial year is creating liquidity problems for some of them. The cess on crude oil was raised earlier this year from Rs. 600 per tonne to Rs. 900 per tonne. Since it has not been passed on to the consumer, it is reimbursable from the oil pool content.

Though any statutory levy imposed by the Government is reimbursed on actual basis, in this case the refineries have been told that reimbursements would be made only at the end of the financial year. The increased cess is estimated to fetch several hundred crore rupees to the Government. It has been calculated that Cochin Refineries Limited (CRL) alone would have about Rs. 100 crores locked up in such dues.

To get over their problem, the refineries are thinking of holding back their payments to the two producers, Oil and Natural Gas Commission (ONGC) and Oil India Limited. The refineries have contended that payment of such huge sums cannot be financed by them unless the normative working capital is revised suitably or a procedure for separate and concurrent reimbursement for such increase in costs is formulated and implemented without delay.

The refineries are also demanding reimbursements from oil pool account for certain new taxes being imposed by the State Government. For example, the turnover tax imposed by the Kerala Government amounts to at least Rs. 1 crore per month for Cochin Refineries. Though CRL is incurring this expenditure since April 1989, the Central Government is yet to take a decision to reimburse it from the oil pool account.

S.L. KHOSLA

Mr. S.L. Khosla, Chairman of Indian Oil Corporation has been chosen as one of the 10 Governors of the newly-formed World Energy Forum. He will represent the oil sector. Other energy sectors covered by the Forum are gas, coal, electricity, nuclear and energy services.



## UB Petroproducts to go onstream by April

The first plant of the Rs. 71-crore petrochemical project of UB Petroproducts Ltd., will become operational by April. This was disclosed by the UB group Chairman Mr. Vijay Mallya recently. Announcing the public issue of UB Petroproducts Ltd., he told newsmen that the company is entering the capital market with a public issue of 98 lakh equity shares of Rs. 10 each for cash at par. The issue will open on September 18.

The company is promoted by the UB group and associates jointly with Tamil Nadu Industrial Development Corporation Ltd. (TIDCO). They along with Montedipe of Italy are also participating in the equity to the extent of 10%. Mr. Mallya said that the project is being set up at Manali industrial complex, near Madras to manufacture 12,000 tpa of propylene oxide which will be capatively used to manufacture 8,000 tpa of polyether polyols, and 7,000 tpa of propylene glycols, using propylene available from Madras Refineries Ltd. (MRL). The company has entered into technical collaboration with Pressindustries AG of Switzerland. Pressindustries are supplying Montedipe with the know-how for propylene oxide and propylene glycol and their own proprietary know-how for polyols. Its polyols technology is superior to the conventional ones and has excellent safety record, he said. Polyols and propylene glycols are import substitute products. Presently, they are being imported at a cost in excess of Rs. 40 crores per year of foreign exchange.

The current level of demand of polyols is of the order of 12,000 tpa and for polypropylene glycols 9,000 tpa. Demand for these products is growing at more than 15 % every year. Polyols are used for the manufacture of polyurethanes which have a wide range of applications. The properties of polyurethanes can be manipulated by appropriate formulations to manufacture flexible foam, semi-rigid foam, rigid

foam, elastomers and surface coating-s/paints. They also find applications in the manufacture of automobile components, housing for electronic gadgets, footwear and as a good substitute whereas propylene glycols are used in pharmaceuticals, food, cosmetics and tobacco processing.

When pointed out that the Minimum Economic Size (MES) of a petrochemical plant is 25,000 tpa, the company Managing Director, Dr. D.R. Gupta, said that they will reach it within two to three years. Mr. Mallya said the turnover is expected to be around Rs. 35 crores, Rs. 55 crores and Rs. 70 crores for the first three years. The cash profit before tax is likely to be around Rs. 19 crores, Rs. 28 crores and Rs. 34 crores respectively.

The UB group is investing more than Rs. 500 crores in the petrochemical industries. They are distributed for the three companies as follows: UB Petroproducts Rs. 71 crores, UB Elastomers Ltd. Rs. 360 crores and Hindustan Polymers Rs. 150 crores. Regarding the Vizag naphtha cracker and other downstream projects, he said that they are vigorously pursuing the Government to give them letters of intent.

Mr. Mallya said that they have proposed to reduce their stake in Herbertsons and McDowells in order to widen the shareholding pattern in the country. At present, the UB group holds 99.8% in Herbertsons and 51% in McDowells. The company would hold around 51% stake in Herbertsons and 40% in McDowells after reduction, he added.

### CO-OPERATION WITH THE ENGG. INDUSTRY: ONGC SETS UP TWO GROUPS

The Oil and Natural Gas Commission (ONGC) has set up two working groups for greater co-operation with the private sector engineering industry. The two groups have been set up to look into the

service area and supply operation ONGC's exploratory and oil drilling efforts.

While the service area group has been set up to look specifically into physical surveying, exploratory drilling production and handling operations supply area working group is to look into indigenisation of equipment hardware required for various operations in the oil and gas sector. In the service area, group discussions have been taking place on the various standard terms and procedures to be adopted, evolve a model system of contracts tenders and contractual obligations in order to arrive at mutually acceptable procedures. In the supply area, efforts are on, to work out the various aspects of indigenisation and the possibilities of export of oil and gas equipment by domestic industry. The Confederation of Engineering Industry (CEI) is coordinating the efforts on behalf of private sector engineering industry.

A number of discussions have taken place between the oil and gas division of CEI and the Oil Industry Development Board (OIDB) on the indigenisation of plant and equipment for the sector. The levels of indigenisation in certain areas have been evaluated to international standards although much more needs to be done in these areas, it is generally realised. Standard equipment that are already being manufactured in the private sector, according to a CEI spokesman, are valve processing equipment, compressor plants and also to a certain extent, offshore platforms and their fabrication.

A number of Indian companies are also readying themselves for offshore exploratory works in collaboration with foreign firms. These companies have already been assured of a price preferential system while bidding for contracts over foreign companies. CEI is also exploring the possibilities of entering into similar working arrangements with Oil India Ltd. (OIL) and Gas Authority of India Limited (GAIL).



## Coal reserves in Orissa higher

Reserves of coal in Orissa are much higher than estimated. Revised estimates show deposits of 41,500 million tonnes, that too in a small part of the potential coal-bearing area in the Talcher (Dhenkanal) and IB Valley (Jharsuguda) sectors. This picture emerged from discussions and papers presented at a two-day seminar on mineral resources of Orissa held in Bhubaneswar recently by the Society of Scientists and Allied Technologists (SSAT), Bhubaneswar.

It was stated that out of the Basinal area of 3,188 sq.km. of the Talcher fields, the potential coal bearing area is 2,220 sq.km. out of which one-tenth (222 sq.km.) contained the bulk of the estimated 41,500 million tonnes. The Talcher reserves are also suited for open cast mining entailing minimal loss of coal, according to papers presented by the Coal Mine Planning and Design Institute (CMPDI), Ranchi. Though the coal had high ash, experiments on dry washing to reduce the ash content were progressing the seminar was told.

Nickel

The seminar felt that the only worthwhile deposits of this mineral in the country, which in Orissa were upto 0.1 to 1.2% content, against 1.5 to 2.5% available in leading nickel producing countries like New Caledonia, Indonesia, Philippines etc. The Orissa ore did not occur as a discrete mineral but was present in "goethites". Part of the nickel occurred within the crystal structure and part on the surface of goethites, and hence the task would be to separate the goethite to enable upgradation of nickel. The high prices commanded by nickel (now Rs. 3.5 lakhs per tonne) and its importance for high-tech and strategic areas warranted an action programme to process the indigenous ore, it was stated.

Chromite

The seminar was told that the Geological Survey of India had revised its estimates of ore in Orissa (constituting

more than 95% of the deposits in the country) to 150 million tonnes from 127 million tonnes. Most of the ore occurred in six extraordinary wide bands, perhaps the widest in the world, with the result that economic mining can be undertaken by the opencast method. So far most chromite ores have been abandoned between 40 and 60 metres depth, leaving untapped reserves.

Bauxite

With sufficient attention having been given already to the east coast deposits suitable for alumina production, attention should now be turned to exploitation of refractory grade bauxites, the seminar was told. Small deposits of bauxites suitable for refractories had been spotted at Kusumdihi in Sundergarh district, and exploration agencies should intensify work for prospecting such deposits.

Graphite

Orissa was described as the largest producer of and as having the largest potential for graphite in the country, with more than 500 deposits having been identified in the western districts. The graphite occurred at shallow depths, with the maximum depth being thirty to forty metres and was easily amenable to mining. The seminar felt that little had been made in the state in establishing deposits of lead, zinc and copper. It wanted sufficient attention paid to pegmatites which are a source of a wide variety of metals: tin, niobium, tantalum, lithium, wolfram and beryllium, besides some varieties of gemstones.

### NLC TO MODERNISE B AND C PLANT

The public sector Neyveli Lignite Corporation (NLC) is to be taken up modernisation of its briquette and carbonising (B and C) plant in collaboration with the German Democratic Republic says a news report. NLC's Chairman and Managing Director Mr. Mahip Singh, told newsmen in

Coimbatore recently that the modernisation programme, envisaging increasing the briquetting plant's capacity was likely to be completed in three years.

The preparation of the feasibility report on the programme by the collaborator had already commenced, and the corporation had sanctioned Rs. 50 lakhs for the purpose, he added. Mr. Singh said the briquetting now working only up to 60% of its installed capacity, produced about 2.3 lakh tonnes to 2.5 lakh tonnes of lignite annually and after modernisation, it would be able to produce up to 4.2 lakh tonnes.

Mr. Singh said with regard to NLC's proposed Rs. 4,000 crore third mine cut project, discussions with the USSR were in progress and a decision on its implementation would be taken soon. He said NLC authorities had held talks with the Tamil Nadu Chief Minister and the State Chief Secretary recently on question of payment of mining royalty into the State Government and a settlement in this connection would be reached soon.

### NEW STEPS TO BRING BACK INDIAN SCIENTISTS

The Government has worked out a number of measures to attract Indian scientists and technologists settled abroad to return to the country. The Council for Scientific and Industrial Research (CSIR) has also started the scheme called "transfer of know-how through expatriate nationals (Tokten)". Under the scheme, the Govt. would pay air fare and subsistence allowance to the Indians during their visit to Indian institutes and industry for transfer of technical know-how and generating professional interaction, an official release said. Other measures include provision for temporary placement under the scheme of scientists pool, creation of supernumerary posts, facilities to import equipment and expeditious clearance of applications for setting up industrial units in the country, he said.



## Massive coal mining to hit ecosystem

Coalfields in the country will face serious environmental problems in the wake of the proposed massive growth in mining operations by the turn of the century, environmental engineers say. With production projected at 417 million tonnes by 1999-2000, land degradation, air, water and noise pollution will assume alarming proportions, they feel.

In view of this, the effect of the 252 million tonne (64 per cent of the total) coal production from opencast mining, envisaged by the turn of the century, can very well be imagined, says Mr. B.P. Baliga, head Environmental Engineering, Coal Mine Planning and Design Institute (CMPDI).

The onslaught on land would affect mainly, the forest cover under which, most of the power grade coal is found, Mr. Baliga says in a report published in the house journal "Minetech". Coal mining was already affecting the inelastic land resources, according to a survey conducted by Coal India to assess the damage to land by subsidence and mined out quarries in eight coalfields under the Central Coalfields. The area of subsidence worked out to 52.5 lakh square metres.

In two coalfields under the Eastern Coalfields, the area covered by subsidence and abandoned quarries was 12.5 lakh square metres and in the Jharia Coalfields over 1,000 hectares. In the Singareni Coalfields 2695 hectares remained degraded. Land degradation was a serious problem arising out of coal mining, admits, the CMPDI Chairman, Mr. S.P. Mathur.

Mr. Mathur, however, claims that coal industry causes less water, air and noise pollution than power, steel and chemical industries. The increase in the depth of opencast mines to about 480 metres from 100 metres, however, threatened to lower the water table and affect the morphology of rivers. In addition,

water pumped out from the mined areas caused acid mine drainage, already being encountered in some areas, Mr. Baliga says. Increase in mining operations coupled with rising transportation and growth in movement on heavy earth moving machinery would spiral emission of obnoxious gases. Rising dependence on opencast mining brings about greater reliance on heavy earth moving machinery, causing noise pollution of between 105 and 110 decibels compared to the permissible limit of 90 decibels. Aware of the impending crisis, a series of measures were underway in the coal industry to minimise the effect of various pollutants.

To control air pollution, surface roads at new projects were being levelled with bituminous material, drills were being equipped with dust extractors and heavy earth moving machines fitted with dust proof cabins. Comprehensive coalfields water supply system has been introduced in Singrauli and Kuju areas. Measures to contain noise pollution were also being taken up.

### MINERAL DEPOSITS FOUND IN MAHARASHTRA

New mineral resources consisting of iron ore and graphite deposits in Sindhudurg district, coal in Nagpur district, limestone in Yavatmal and Gadchiroli districts and granite in Nanded district, have been identified by the State Directorate of Geology and Mines in its excavations undertaken during the field season in 1988-89.

At a meeting of the State geological programming board at Bombay on August 18, which was presided over by the State Industries Secretary Mr. S.G. Kale, the geological work carried out by the State Directorate and the Geological Survey of India (GSI) in Maharashtra during the field season 1988-89 was reviewed.

The meeting revealed that during the field season 1988-89 the Directorate carried out geological survey over 1.8 square km-area and completed drilling of about 28,000 metres. As a result of this work, new mineral resources have been located by the Directorate, which include 117 million tonnes of coal in Nagpur, Yavatmal and Chandrapur districts, 16 million tonnes of limestone in Yavatmal and Gadchiroli districts, 1 million tonne of iron ore and 1.56 million tonnes of graphite in Sindhudurg district, and 433 square metres granite in Nanded district, which can be used as ornamental stones.

The significant finding of the Directorate is the discovery of two new coal bearing areas. In the Khandwa-Bharatwada area in Nagpur district and in the Kondhaa-Nandori area in Chandrapur district. These discoveries of mineral deposits would augment the mineral production and promote mineral based industries in the State.

The Directorate proposes to undertake detailed exploration for coal, limestone, dolomite, fluorite, iron ore, bauxite, graphite, silimanite, kyanite and granite, among others during the field season of 1989-90.

### SULPHATE RESISTANT PORTLAND CEMENT UNDER BIS

Sulphate resisting Portland cement has been brought under the Bureau of Indian Standards' (BIS) certification marks scheme for the first time. The use of sulphate resisting Portland cement is particularly beneficial in conditions where concrete is exposed to the risk of deterioration when it comes in contact with soils and ground waters containing excessive amount of sulphates.

Some other important products which have been brought under the BIS scheme are instrument trays and zinc oxide self-adhesive plaster, a BIS press release said.



# Optimising design and cost of seawater reverse osmosis systems

J.C. van DIJK,<sup>1</sup> P.J. de MOEL<sup>1</sup> AND H.A. van den BERKMORTEL<sup>3</sup>

## Summary

The influence of design parameters, such as raw water temperature and total dissolved solids content (TDS), design pressure, and recovery, on total units cost for the production of desalinated water from the Arabian Gulf in Saudi Arabia by means of reverse osmosis is presented for plant capacities ranging from 75,000 m<sup>3</sup>/d to 700,000 m<sup>3</sup>/d. It is concluded that total unit water cost is significantly influenced by raw water TDS, design pressure and design recovery. It is recommended to investigate the feasibility of operation at increased pressure. Finally, total water costs for reverse osmosis desalination are presented also as a function of salinity, with TDS levels ranging from 3000 mg/l to 55,000 mg/l.

## Introduction

Aramco, the major oil producing company of Saudi Arabia, has recently investigated the feasibility of desalinated seawater as a source for water supply. Aramco Overseas Company has performed these studies with the assistance of DHV Consulting Engineers. In this paper, part of the results of these studies with respect to seawater reverse osmosis (RO) desalination will be highlighted, while also the established cost function for RO desalinated water depending on raw water TDS content is presented.

## Basis of cost estimates

### Plant size and productivity

Plant sizes have been selected between 75,000 and 700,000

m<sup>3</sup>/d, being the range that will eventually be required. In view of the variation in water demand over the year, average plant productivity factor is 0.66.

### Investment cost development

Investment cost has been developed based on the design of a plant with a capacity of 75,000 m<sup>3</sup>/d. For larger capacities a scale factor of 0.7 was applied for the civil works and a scale factor of 0.9 was applied for the mechanical and electrical equipment. Depreciation periods of 30 years for civil works and 15 years for mechanical/electrical works have been used. The interest rate used is 5%. In addition, a literature survey was carried out to determine investment costs of existing seawater RO plants (Table 1).

### Operation and maintenance cost development

#### Operation

Labour requirements have been assessed for a plant capacity of 75,000 m<sup>3</sup>/d. For larger capacities a scale factor of 0.7 has been applied (Table 2).

#### Maintenance

Maintenance cost has been taken as 1% of the capital investment per year (Table 3).

#### Energy

Electricity cost has been set at 0.061 US \$/kWh (Table 4).

Table 1

### Investment cost seawater RO plants

Most data in this table are based on calculations and estimates, as the actual price information is not known in detail. The figures given with an asterisk are quoted in the literature.

| Plant                           | Capacity<br>(m <sup>3</sup> /d) | Investment cost (excluding intake) |                        |                      |                      |                        |                                |                        |
|---------------------------------|---------------------------------|------------------------------------|------------------------|----------------------|----------------------|------------------------|--------------------------------|------------------------|
|                                 |                                 | Total                              |                        | Membranes            | RO equipment         |                        | Pretreatment and miscellaneous |                        |
|                                 |                                 | (10 <sup>6</sup> \$)               | (\$/m <sup>3</sup> /d) | (10 <sup>6</sup> \$) | (10 <sup>6</sup> \$) | (\$/m <sup>3</sup> /d) | (10 <sup>6</sup> \$)           | (\$/m <sup>3</sup> /d) |
| Literature                      |                                 |                                    |                        |                      |                      |                        |                                |                        |
| Yanbu                           | 5,000*                          | 12.3*                              | 2460                   | 2.8                  | 6.5                  | 1300                   | 3                              | 600                    |
| Jeddah                          | 12,000*                         | 31.0*                              | 2583                   | 6-7                  | 12-13                | 1000-1083              | 12*                            | 1000                   |
| Key West                        | 11,300*                         | 10.0*                              | 885                    | 3-4                  | 5-6                  | 442-531                | 1                              | 88                     |
| Tanajib                         | 13,600*                         | 38.0*                              | 2794                   | 13                   | 13-15                | 955-1102               | 10-12                          | 735-882                |
| Bahrain                         | 45,000*                         | 110.0*                             | 2444                   | 31                   | 43                   | 955                    | 36                             | 800                    |
| Vendor info                     |                                 |                                    |                        |                      |                      |                        |                                |                        |
| Offer Weir                      |                                 |                                    |                        |                      |                      |                        |                                |                        |
| Westgarth                       | 200,000*                        | 325.0*                             | 1625                   | 177*                 | 148                  | 740                    |                                |                        |
| Offer UOP                       | 12,500*                         | 10.6*                              | 848                    | 6                    | 48                   | 384                    |                                |                        |
| Study results                   |                                 |                                    |                        |                      |                      |                        |                                |                        |
| Aramco (24.9% overall recovery) | 75,000                          | 190.0                              | 2533                   | 70                   | 70                   | 933                    | 50                             | 667                    |

<sup>1</sup> DHV Consulting Engineers, P.O. Box 85, Amersfoort (The Netherlands). Tel (33)689111, Telex: 79348 dhuni.

<sup>3</sup> Aramco Overseas Company, The Hague (The Netherlands).



### Chemicals

Chemical costs are based on Saudi Arabian market costs (Table 5).

### Membrane replacement

Membrane replacement rate has been set at 20% per year (Table 6).

### Basis of design

The design of the seawater RO plant has been based on the principle of proven design. One of the consequences of

this principle is that on open seawater intake has been selected, as insufficient information regarding the feasibility of sea wells in the Eastern Province of Saudi Arabia is available.

The water composition of the Arabian Gulf can be described as a typical seawater, although some important parameters are outside the range normally encountered in seawater with a temperature which varies between 15°C and 35°C and TDS varying between 44,000 mg/l and 55,000 mg/l (44,000 mg/l for base case), and beyond.

**Table 2**  
Operation Cost

| Plant         | Size (m <sup>3</sup> /d) | Men/8 h shift | Cost (\$/m <sup>3</sup> ) |
|---------------|--------------------------|---------------|---------------------------|
| Literature    |                          |               |                           |
| Jeddah        | 12,000                   | 2.0           |                           |
| Salbukh       | 59,800                   | 4.0           |                           |
| Cadafé        | 3,000                    | 3.0           | 0.13                      |
| Key West      | 11,300                   | 1.0           | 0.04                      |
| Cape Coral    | 18,900                   | 1.0           |                           |
| Venice        | 3,800                    | 0.5           |                           |
| Study results |                          |               |                           |
| Aramco        | 75,000                   | 7.0           | 0.07*                     |

\* Cost estimate based on 1 plant manager, 5 deputy managers/engineers (1 per shift), and 30 operating crew (6 per shift).

**Table 3**  
Maintenance Cost

| Plant         | Size (m <sup>3</sup> /d) | Cost (\$/m <sup>3</sup> )             |
|---------------|--------------------------|---------------------------------------|
| Literature    |                          |                                       |
| Key West      | 11,300                   | 0.09                                  |
| Cadafé        | 3,800                    | 0.08                                  |
| Jeddah        | 12,000                   | 0.80 (including membrane replacement) |
| Vendor info   |                          |                                       |
| Offer Weir    |                          |                                       |
| Westgarth     | 200,000                  | 0.07                                  |
| Offer UOP     | 12,500                   | 0.39 (including membrane replacement) |
| Study results |                          |                                       |
| Aramco        | 75,000                   | 0.09*                                 |

\* Cost estimate based on 1% investment cost mechanical and electrical.

**Table 4**  
Electricity Consumption

| Plant                | Size (m <sup>3</sup> /d) | Energy Consumption (kWh/m <sup>3</sup> ) |        | Cost (\$/m <sup>3</sup> ) |        |
|----------------------|--------------------------|------------------------------------------|--------|---------------------------|--------|
|                      |                          | WER**                                    | WOER** | WER**                     | WOER** |
| Literature           |                          |                                          |        |                           |        |
| Key West             | 11,300                   | 6.7                                      | 10.1   | 0.54                      | 0.81   |
| Cadafé               | 3,800                    |                                          | 12.3   |                           | 0.42   |
| Jeddah               | 12,000                   |                                          | 10.0   |                           |        |
| Porto Santo          | 500                      | 5.6                                      | 7.5    |                           |        |
| Bahrein              | 45,000                   | 10.3                                     | 13.3   |                           |        |
| Vendor info          |                          |                                          |        |                           |        |
| Offer UOP            | 12,500                   | 8.2                                      |        | 0.49                      |        |
| Offer Weir Westgarth | 200,000                  | -                                        |        | -                         |        |
| Study results        |                          |                                          |        |                           |        |
| Aramco               | 75,000                   | 8.2                                      |        | 0.49*                     |        |

\* Cost estimate based on calculated energy consumption, energy cost 0.061 \$/kWh.

\*\* WER = with energy recovery, WOER = without energy recovery.



**Table 5**  
**Chemical Cost**

| Plant                | Size (m <sup>3</sup> /d) | Cost (\$/m <sup>3</sup> ) |
|----------------------|--------------------------|---------------------------|
| Temperature          |                          |                           |
| Key West             | 11,300                   | 0.03                      |
| Cadafé               | 3,800                    | 0.06                      |
| Jeddah               | 12,000                   | 0.06                      |
| Vendor info          |                          |                           |
| Offer UOP            | 12,500                   | 0.15                      |
| Offer Weir Westgarth | 200,000                  |                           |
| Study results        |                          |                           |
| Aramco               | 75,000                   | 0.13                      |

The process of the designed plant is briefly described below.

#### Intake

Raw seawater passes a rack and a microstrainer before it is pumped into the pretreatment building. Marine growth in the microstrainer and the pretreatment section is prevented by intermittent bisulphite dosing, with pH control by caustic soda.

#### Pretreatment

Pretreatment of surface seawater has to focus on calcium carbonate (CaCO<sub>3</sub>) scaling, suspended matter and biological matter.

#### CaCO<sub>3</sub> scaling

The high salinity of the water will allow for a RO recovery of 30% at the maximum. At this recovery, acidification of the feedwater to a pH of 7.6 will result in a negative Stiff & Davis Index in all parts of the permeators. To obtain this pH a sulphuric acid dose of 15 mg/l H<sub>2</sub>SO<sub>4</sub> is required.

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#### Suspended matter

For surface seawater, dosing of a coagulant followed by two-stage precipitate removal is a common practice for the removal of suspended matter. In view of periods with peak loadings of suspended solids, with corresponding high dosing levels, preference is given to a coagulation process with a large flexibility to suspended solid levels. Therefore, as coagulation process, a configuration with chemical dosing, flocculation followed by lamella sedimentation and down-flow dual media filtration has been selected. To improve the polishing effect of the filtration stage, a coagulant may be dosed after the sedimentation.

#### Biological matter

Reverse osmosis desalination of surface seawater requires disinfection to prevent biological activity in the permeators. Chlorination is most often applied for disinfection. Prior to entering the RO unit, the feedwater should be dechlorinated. It has been found that chlorination may result in the formation of hydrobromic acid and carcinogenic haloforms, e.g., bromoforms. Hydrobromic acid is hardly converted by a dechlorination reagent, so it may attack the membranes. Haloforms are concentrated in the RO product water, in some cases leading to unacceptable levels, while haloforms may also deteriorate the membranes. For these reasons, chlorination is considered not to be an appropriate disinfection method.

**Table 6**  
**Membrane Replacement**

| Plant                | Size (m <sup>3</sup> /d)   | Replacement rate (%/y) | Cost (\$/m <sup>3</sup> )    |
|----------------------|----------------------------|------------------------|------------------------------|
| Temperature          |                            |                        |                              |
| Key West             | 11,300                     | 0                      | 0                            |
| Cadafé               | 3,800                      | 0                      | 0                            |
| Ras Al Khaimah       | 600                        | 0.5                    | 0.16                         |
| UBF 2 270            | 8                          |                        |                              |
| Jeddah               | 12,000                     | 33                     |                              |
| Vendor info          |                            |                        |                              |
| Du Pont              |                            |                        |                              |
| — experience         | 41 plants<br>560 membranes | 5                      |                              |
| — guarantee          |                            | 12                     | 0.26                         |
| Offer Weir Westgarth | 200,000                    | 20                     | 0.58                         |
| Offer UOP            | 12,500                     | 20                     | 0.39 (including maintenance) |
| Study results        |                            |                        |                              |
| Aramco               | 75,000                     | 20                     | 0.77*                        |

Cost estimate based on 5-year membrane life, membrane type B10 6840-063 N, membrane cost \$ 7000.



As alternatives for chlorination disinfection by ozone, copper sulphate or sulphite can be mentioned. Since disinfection is aimed at biological growth prevention only, continuous disinfection is probably not required. Growth prevention can be achieved by intermittent dosing of high concentrations of disinfectant (shock treatment). Membrane manufacturers propose bisulphite shock treatment at a dose of 500 mg/l during 30 min. In view of the absence of large scale practice with shock treatment as the sole biological fouling prevention method, the feasibility of this system should be subject to further investigations.

For design purposes, it is assumed that bisulphite shock treatment is an appropriate method to prevent biological activity in RO permeators, as well as in the pretreatment. Since the reduction reaction of bisulphite reduces the pH, caustic soda is added simultaneously for pH control. The pretreatment section is divided into six parallel units, each with a capacity of 2,100 m<sup>3</sup>/h. If one unit is taken out of operation, the other units will be operated at a capacity of 2,520 m<sup>3</sup>/h (17% capacity increase per unit).

#### Reverse Osmosis

The RO section consists of booster pumps, acid dosing, cartridge filters and two-stage RO permeators. The acid dosing prevents CaCO<sub>3</sub> scaling in the permeators, the cartridge filters function for safety filtration. In view of the feedwater TDS, a RO recovery of 27% has been selected for the first stage. The second stage operates at a recovery of 85%. The first stage will reduce the TDS to some 1100 mg/l, whereas the second stage will reduce the TDS further to 120 mg/l. By blending, the required TDS of 500 mg/l is achieved.

The energy available from the brine is recovered in a turbine, after which the first stage brine is discharged into the sea. Part of the brine is used for filter backwash water in the pretreatment section. The second-stage brine is reused as first stage feedwater.

The first-stage RO high-pressure pumps operate at a constant capacity with a fixed pressure of 5.5 MPa (800 psi). Therefore the productivity of the permeators, or the recovery, will not be constant during the year as a result of the fluctuations of the feedwater temperature. The water production in January will be approximately 33% less than in July/August. However, as the water demand in January will be 46% less than in July/August this is acceptable. A similar system setup is selected for the second-stage RO section.

An intermittent storage tank functions as flow balancing tank between both RO stages. The number of second-stage RO units in operation is controlled by the actual water demand and the TDS content of the first-stage product water. The first-stage surplus from the overflow of the intermed-

iate storage tank is blended with the second-stage product water. For reasons of reliability the RO section is subdivided into two identical sections. Each section consists of six first stage RO units and three second-stage RO units.

#### Post-treatment

The post-treatment unit will include dosing of lime and carbon dioxide for corrosion prevention, and dosing of chlorine for disinfection.

#### Optimising

The question can be raised as to which design parameters significantly influence the total cost of the seawater RO plant. This question will be answered by analysing the different components.

#### Membrane cost

Membrane cost is determined mainly by membrane productivity. The productivity of membranes, i.e. the produced water quantity per unit of time, is determined by the following factors:

- TDS content of the water
- Temperature of the water
- Time
- Feed Pressure
- Recovery

The TDS content of Arabian Gulf water is reported to vary between 44,000 mg/l (at Ras Tanura) and 55,000 mg/l (Quaryyah). The temperature of Arabian Gulf water varies over the year between 15°C and 35°C. For design purposes, the time should be taken as 5 years. Feed pressure is normally specified as 1000 psi (6.9 MPa), but at temperatures above 27°C the Du Pont specifications require a reduction in feed pressure down to 800 psi (5.5 MPa) at 35°C.

Recovery can be selected independently of the other parameters. A higher recovery leads to decreased productivity as a result of the increase in osmotic pressure in the brine. The combined effects of TDS content, temperature, feed pressure and recovery on membrane productivity after 5 years have been calculated with a computer program, and are given in Fig. 1.

From Fig. 1 it can be concluded that membrane productivity and consequently membrane cost are influenced significantly by feedwater TDS and temperature, pressure and recovery. It seems obvious that utmost attention should be given to determine actual and design TDS and temperature levels. For purposes of calculation, the Du Pont B10 membrane 6840-063 N (8 in model) will be used. Investment cost for this membrane are \$7000. The annual costs, at 5 years depreciation and 5% interest, are 23% of the investment cost, i.e. \$1610 per membrane. When the productivity of the mem-



When the productivity of the membrane is set at  $X$   $\text{m}^3/\text{d}$ , it can be calculated that the total annual water production is  $X \cdot 3.78 \cdot 365 \cdot 0.66$  (productivity factor)  $= 911X \text{ m}^3$ . Consequently, membrane cost per  $\text{m}^3$  is  $610/(911X) = 1.77/X \text{ \$/m}^3$ .

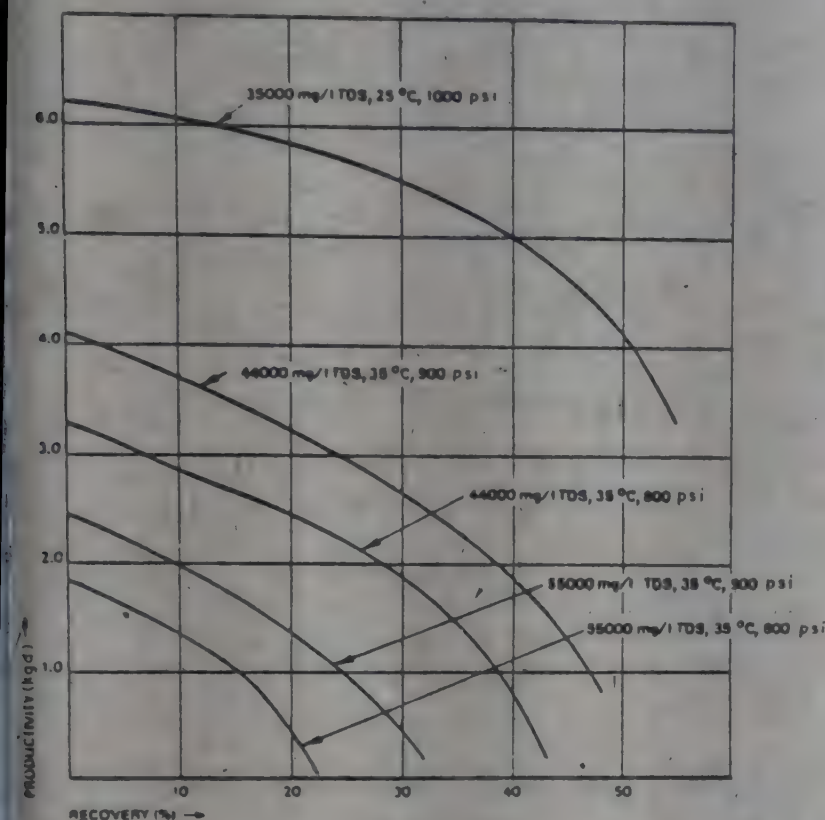


Fig. 1 Productivity of B10 membranes (seawater, type 6840-063 N)

As mentioned before, the feed pressure is normally specified by the membrane manufacturer. In the case of the Du Pont B10 membrane, this would mean that the pressure at  $35^\circ\text{C}$  is limited to 800 psi (5.5 MPa). However, equipment suppliers are known to exceed these pressure limitations at certain occasions. As it is obvious that there are considerable cost implications involved, the following two cases will be studied:

- Operation at 800 psi (5.5 MPa).
- Operation at 900 psi (6.2 MPa).

Recovery is the main design parameter that has to be optimised. In Table 7 membrane productivity and cost are therefore given as a function of recovery.

### RO equipment cost

The cost of the RO equipment is determined primarily by the flow through the unit. At a certain product water capacity — in this report taken as  $75,000 \text{ m}^3/\text{d}$  — this means that the cost is inversely proportional to the recovery ( $\gamma$ ). With equipment cost estimated at \$290 per  $\text{m}^3/\text{d}$  feed capacity (for a plant capacity of  $75,000 \text{ m}^3/\text{d}$  (Table 1), and assuming a scale factor of 0.9) the RO equipment cost then becomes:

$$290 \gamma^{-0.9} \text{ \$/m}^3/\text{d}$$

With a depreciation period of 15 years, 5% interest and a productivity factor of 0.66, the RO equipment cost ( $\text{\$/m}^3$ ) becomes:

$$290 \gamma^{-0.9} \times \frac{0.10}{365 \times 0.66} = 0.12 \gamma^{-0.9}$$

In Table 7 RO equipment cost are given as a function of recovery.

### Energy Cost

The energy consumption of the RO unit depends on the feed pressure ( $P$ ), the recovery ( $\gamma$ ) and the energy recovery. The required pumping energy can be calculated as:

$$E \text{ (kWh/m}^3\text{)} = \frac{P \text{ (psi)} \times 6.9}{\gamma \times 3600 \times \text{Eff}}$$

Where Eff = combined efficiency of pump and motor. The energy recovery can be calculated as:

$$E_{\text{rec}} \text{ (kWh/m}^3\text{)} = \frac{(P - 50) 6.9}{\gamma \times 3600} = \text{Eff}_{\text{rec}} \times (1 - \gamma)$$

where  $\text{Eff}_{\text{rec}}$  = efficiency of the energy recovery turbine. The energy consumption of pre- and post-treatment can be estimated at  $0.5/\gamma \text{ kWh/m}^3$ . The energy consumption of the RO unit, with or without pre- and post-treatment, is given in Fig. 2. From this figure the energy cost can be calculated as given in table 7.

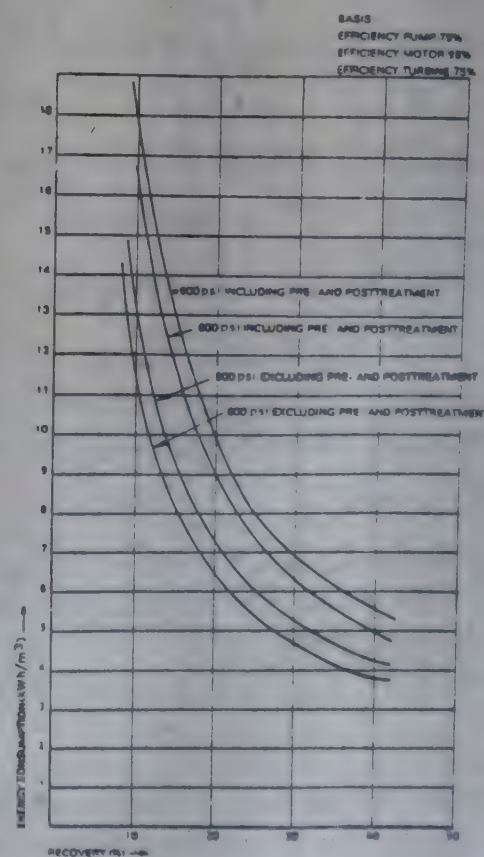


Fig. 2 Energy consumption of seawater reverse osmosis plant



### Pretreatment cost

These costs depend on the type and extent of pretreatment and, in the same manner as the RO equipment costs, on the recovery. With pretreatment costs estimated at 250 \$/m<sup>3</sup>/d feed capacity (for a plant capacity of 75,000 m<sup>3</sup>/d (table 1), and assuming a scale factor of 0.7) the pretreatment costs become:

$$250 \gamma^{-0.7} \text{ $/m}^3/\text{d}$$

With a depreciation period of 25 years, 5% interest and a productivity factor of 0.66, the pretreatment cost (\$/m<sup>3</sup>) becomes:

$$250 \gamma^{-0.7} \times \frac{0.07}{365 \times 0.66} = 0.07 \gamma^{-0.7}$$

In Table 7 the pretreatment costs are given as a function of recovery.

### Cost of intake

These costs are more or less fixed and can be estimated at 0.16 \$/m<sup>3</sup> (for a plant capacity of 75,000 m<sup>3</sup>/d.)

### Cost of operation and maintenance

These costs are more or less fixed and can be estimated at 0.29 \$/m<sup>3</sup> (for a plant capacity of 75,000 m<sup>3</sup>/d, Tables 2-5).

Total water cost can now be analysed depending on:

- Raw water composition (44,000 mg/l and 55,000 mg/l TDS).
- Feed pressure (800 psi and 900 psi).
- Recovery (10-40%).

The results are represented in Table 7 and Fig. 3.

### Conclusions

From Table 7 and Fig. 3 the following conclusions can be drawn:

(1) Water costs are significantly influenced by the selected recovery. In general the costs decrease as the optimal recovery is higher.

(2) Total water costs are influenced significantly by raw water TDS. Using the Du Pont specifications, the cost of seawater RO increase from 1.62 \$/m<sup>3</sup> at 35,000 mg/l TDS to 2.32 \$/m<sup>3</sup> at 44,000 mg/l TDS to 3.84 \$/m<sup>3</sup> at 55,000 mg/l TDS.

(3) Operation at a pressure of 900 psi rather than the (Du Pont) specified 800 psi will lead to a significant drop in total water costs down to 2.05 \$/m<sup>3</sup> at 44,000 mg/l TDS, and to 3.09 \$/m<sup>3</sup> at 55,000 mg/l TDS.

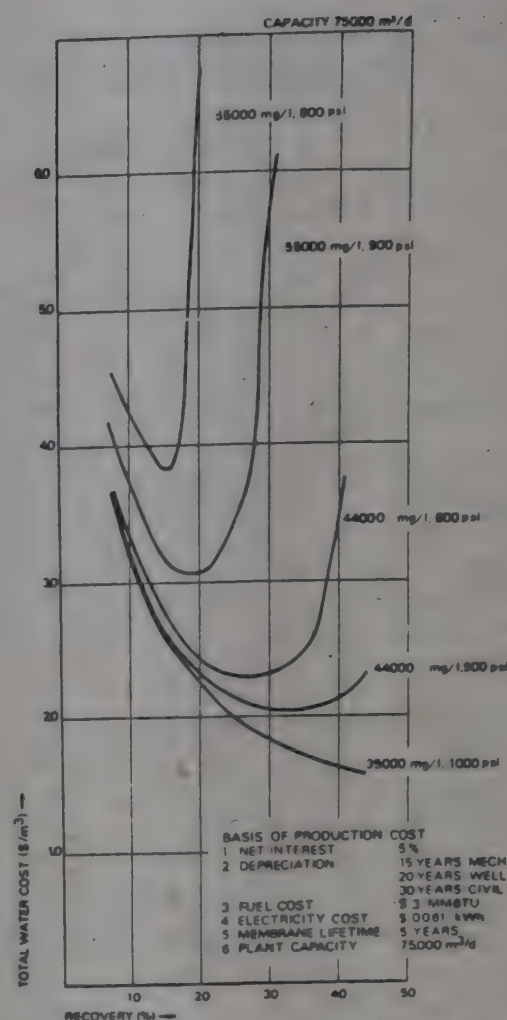


Fig. 3 Total water production cost of seawater reverse osmosis plant

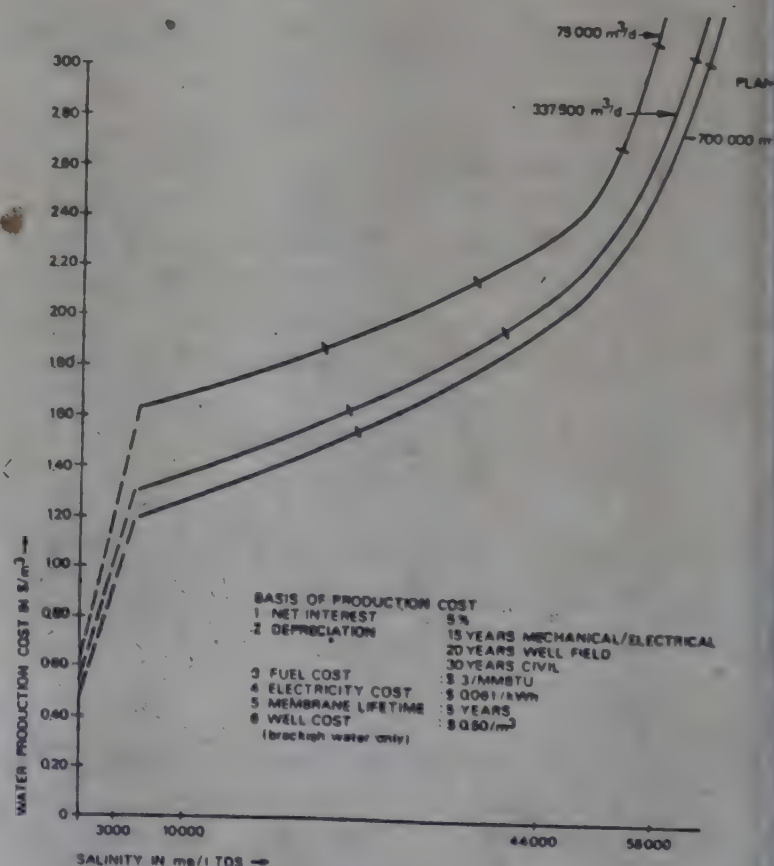


Fig. 4 Unit water production cost for bulk desalted water supply as a function of salinity and plant capacity (RO process)



**Table 7**  
**Total water cost seawater RO plant (\$/m<sup>3</sup>)**

| Recovery (%)                   | Membrane cost | RO equipment cost | Energy cost | Pretreatment | Intake + O & M | Total |
|--------------------------------|---------------|-------------------|-------------|--------------|----------------|-------|
| <b>1) 44,000 ppm, 800 psi</b>  |               |                   |             |              |                |       |
| 10                             | 0.62          | 0.95              | 1.02        | 0.35         | 0.45           | 3.39  |
| 15                             | 0.67          | 0.66              | 0.70        | 0.26         | 0.45           | 2.74  |
| 20                             | 0.72          | 0.51              | 0.55        | 0.22         | 0.45           | 2.45  |
| 25                             | 0.81          | 0.42              | 0.45        | 0.18         | 0.45           | 2.31  |
| 30                             | 0.98          | 0.36              | 0.38        | 0.16         | 0.45           | 2.34  |
| 35                             | 1.31          | 0.31              | 0.34        | 0.15         | 0.45           | 2.56  |
| 40                             | 2.37          | 0.27              | 0.32        | 0.14         | 0.45           | 3.55  |
| <b>2) 44,000 ppm, 900 psi</b>  |               |                   |             |              |                |       |
| 10                             | 0.49          | 0.95              | 1.11        | 0.35         | 0.45           | 3.35  |
| 15                             | 0.52          | 0.66              | 0.76        | 0.26         | 0.45           | 2.65  |
| 20                             | 0.55          | 0.51              | 0.60        | 0.22         | 0.45           | 2.33  |
| 25                             | 0.59          | 0.42              | 0.48        | 0.18         | 0.45           | 2.12  |
| 30                             | 0.67          | 0.36              | 0.41        | 0.16         | 0.45           | 2.05  |
| 35                             | 0.77          | 0.31              | 0.37        | 0.15         | 0.45           | 2.06  |
| 40                             | 0.93          | 0.27              | 0.34        | 0.14         | 0.45           | 2.13  |
| <b>3) 55,000 ppm, 800 psi</b>  |               |                   |             |              |                |       |
| 10                             | 1.36          | 0.95              | 1.02        | 0.35         | 0.45           | 4.13  |
| 15                             | 1.77          | 0.66              | 0.70        | 0.26         | 0.45           | 3.84  |
| 20                             | 5.05          | 0.51              | 0.55        | 0.22         | 0.45           | 6.78  |
| 25                             | not feasible  |                   |             |              |                |       |
| <b>4) 55,000 ppm, 900 psi</b>  |               |                   |             |              |                |       |
| 10                             | 0.89          | 0.95              | 1.11        | 0.35         | 0.45           | 3.75  |
| 15                             | 1.05          | 0.66              | 0.76        | 0.26         | 0.45           | 3.18  |
| 20                             | 1.31          | 0.51              | 0.60        | 0.22         | 0.45           | 3.09  |
| 25                             | 1.87          | 0.42              | 0.48        | 0.18         | 0.45           | 3.40  |
| 30                             | 4.43          | 0.36              | 0.41        | 0.16         | 0.45           | 5.81  |
| 35                             | not feasible  |                   |             |              |                |       |
| <b>5) 35,000 ppm, 1000 psi</b> |               |                   |             |              |                |       |
| 10                             | 0.29          | 0.95              | 1.28        | 0.35         | 0.45           | 3.32  |
| 15                             | 0.29          | 0.66              | 0.95        | 0.26         | 0.45           | 2.61  |
| 20                             | 0.30          | 0.51              | 0.75        | 0.22         | 0.45           | 2.23  |
| 25                             | 0.31          | 0.42              | 0.60        | 0.18         | 0.45           | 1.96  |
| 30                             | 0.32          | 0.36              | 0.51        | 0.16         | 0.45           | 1.80  |
| 35                             | 0.33          | 0.31              | 0.46        | 0.15         | 0.45           | 1.70  |
| 40                             | 0.36          | 0.27              | 0.43        | 0.14         | 0.45           | 1.65  |

It is emphasised that equipment suppliers are reported to have exceeded Du Pont's specifications in at least one occasion. As the effects of this increased pressure are yet unknown, it is recommended to study these effects.

(4) Total water costs may decrease significantly when membrane costs are lower. For example, other membranes are known to be significantly cheaper than Du Pont membranes at the same productivity. This would lead to a decrease in cost of some 0.40 \$/m<sup>3</sup>.

#### Concluding remarks

The methodology described in this paper has also been

applied to assess the costs of other treatment processes such as low pressure RO (for brackish water) ED(R), MSF, MVC, MES and EVC. The results indicate an interesting dependence of total desalinated water cost upon raw water TDS, which for the RO process is presented in Fig. 4.

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# CHEMICAL WEEKLY

## SUPPLEMENT ON

# LEATHER PROCESSING

## Process Technologies with reduced pollution

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### Introduction

Any industrial production is associated with the problem of disposal of effluents. The effluent varies from simple chemical substances to toxic, harmful, noxious substances and materials varying in the degree of biodegradability. The effective solution to this problem can be achieved by either (i) zero-pollution i.e. by adopting proper effluent treatment system for almost complete removal of pollutants or (ii) reduced pollution through process technology i.e. by adjusting the processing procedure in such a way as to reduce the harmful pollutants in the effluent as the process of zero pollution sounds theoretical at this stage.

Pollution can be reduced or eliminated by process modification, chemical and raw material substitution and/or recovery of byproducts. Since leather making involves the removal of non-collagenous materials from the skin and subsequent stabilisation of collagen by tanning, pollutants arise from both hides and also from incompletely absorbed chemicals used in processing.

In the leather processing, both liquid and solid pollutants are generated at various stages. With accumulation of more accurate data on the treatment of tannery waste management, it is becoming increasingly obvious that pollution abatement would be very expensive if tanneries were forced to meet the stringent limits enforced by effluent authorities. The principal causes for the high cost of tannery waste treatment are the large effluent volume and the high pollution load. The recurring and non-recurring cost of effluent treatment with the most effective physico-chemical and biological treatment would work out cheaper when the volume of the effluent to be handled and toxic load are reduced.

With the advancement of knowledge on process technology and availability of better processing vessels, designed based on chemical engineering principles, processes could be developed with improved uptake of chemical, reduced input of water and consequently reduced pollutant load in the effluent.

The methods and techniques by which the pollution can be reduced or minimised are as follows:

- recycling techniques.
- use of newer processing vessels aiding better uptake of chemicals.
- substitution (at least partially) of harmful pollutants.
- development of alternative tanning systems.

Results obtained through some of these approaches for various operations of leather making are reported below:

### Soaking:

During the process of soaking the salted hides, dissolution of interfibrillary proteins like albumins and globulins occur due to the solubilising effect exerted by the salt solution. Consequently, the effluent from the soak yard would be rich in salt, protein degraded products, preservatives, bacteria and defilements and this constitutes about 20-25% of total load of effluent.

In general, soaking is done in 2 or 3 stages with change of water (quantity varying from 300-400%) each time. It has been found that by employing counter current reuse of soak liquor, the volume of effluent can be reduced to one-thirds without any impairment in the quality of the hides and without increase in the load of the effluent.

The counter current technique adopted for reuse of soak liquor is shown in Fig. 1 and the characteristics of the liquors are given in Table-1.

It can be observed from the table that soak-III is the least loaded effluent with low chlorides and with low dissolved proteins and hence low BOD. This can be used for soaking once-washed hide. The resultant effluent has its characteristics similar to that of soak-II as can be seen from Column 8 & 2 of Table-1.

The effluent from soak-II can be used for pre soak or soak-I for fresh sides without any impairment in quality of hides and the resultant combined effluent is similar to the effluent from soak-I as seen from columns 4 & 11 of the Table-1.



Table-1  
Counter current soaking operation

| Parameter          | Control Soak I | Control Soak II | Control Soak III | Combined Soak II & I | Experiment Combined Soak | Experiment Combined Soak | Experiment Combined Soak | Combined Soak III & II | Soak III |
|--------------------|----------------|-----------------|------------------|----------------------|--------------------------|--------------------------|--------------------------|------------------------|----------|
|                    | 1              | 2               | 3                | 4                    | 5                        | 6                        | 7                        | 8                      | 9        |
| pH                 | 7.25           | 7.80            | 7.76             | 7.33                 | 7.47                     | 7.55                     | 7.52                     | 7.84                   | 7.91     |
| BOD                | 943            | 330             | 110              | 1290                 | 1400                     | 1375                     | 1200                     | 325                    | 100      |
| COD                | 3960           | 1131            | 326              | 5019                 | 5230                     | 4820                     | 4640                     | 1254                   | 294      |
| Total solids       | 142184         | 21585           | 2778             | 161915               | 165495                   | 163705                   | 127280                   | 20365                  | 5025     |
| Dissolved solids   | 114605         | 17260           | 2465             | 144420               | 145655                   | 133570                   | 110530                   | 15800                  | 4650     |
| Suspended solids   | 27580          | 4325            | 310              | 17495                | 19840                    | 30175                    | 16750                    | 4565                   | 375      |
| Chlorides          | 60350          | 10844           | 1980             | 64121                | 83924                    | 77323                    | 68836                    | 10089                  | 1886     |
| Dissolved proteins | 590            | 190             | 80               | 600                  | 920                      | 872                      | 840                      | 170                    | 80       |

All the values except pH are expressed in mg/l.

This in turn offers a potential for counter current reuse of soak liquor without altering the properties of final leather.

Comparison between the three times used counter current liquor with that of the total effluent from three independent soaks is shown in Table 2.

Table 2  
Comparative value of soaking operation

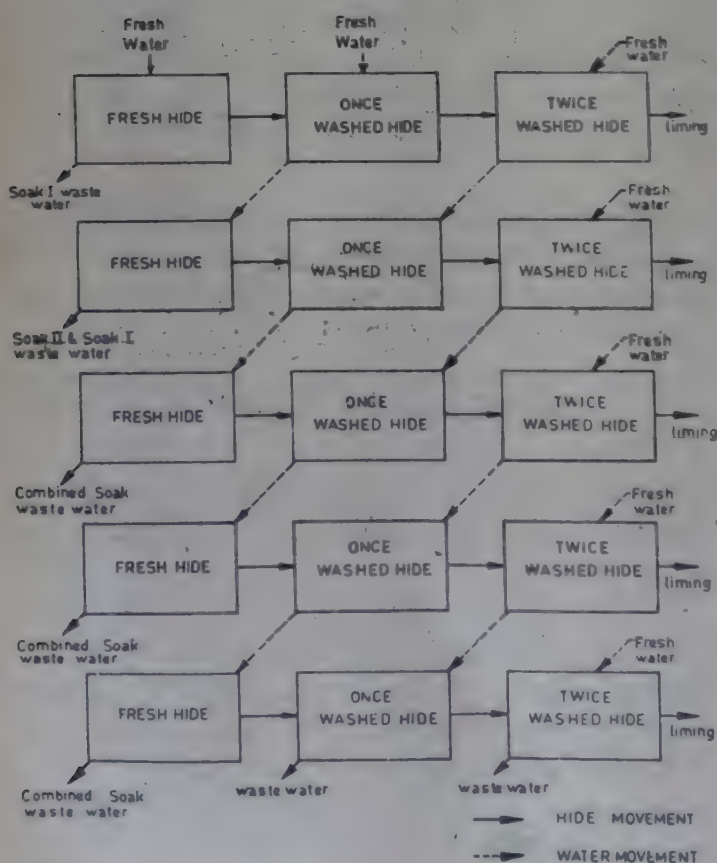
|                  | Control 900% water used | Experiment 300% water used |
|------------------|-------------------------|----------------------------|
| pH               | 7.5                     |                            |
| BOD              | 1383                    | 1                          |
| COD              | 5417                    | 4                          |
| Total Solids     | 166545                  | 152                        |
| Dissolved Solids | 134330                  | 129                        |
| Suspended Solids | 32215                   | 22                         |
| Chlorides        | 73174                   | 76                         |
| Protein          | 860                     |                            |

All values except pH are expressed in mg/l.

Control: Total value of soak I + soak II + soak III operation (300% + 300% = 900% water used).

Experiment: Average value of three experiments of counter current soaking method (300% water used).

Comparison between the three times used counter current liquor with that of the total effluent from the three independent soaks is shown in Table-2.



Counter current soaking operation

Fig. 1



By this counter current technique the soak liquor effluent volume decreased by 66%, without any additional pollution load. This system can be adopted by tanneries and can be extended to paddle soaking and drums as well. As the solar evaporating pans occupy major portion in any treatment system, reduction in soak liquor volume would effectively reduce the space required for the evaporating pans and hence the cost of construction.

### Liming

Recycling of lime liquors is very well known and is being practiced by the industry in the case of sulphide-free lime liquors. Attempts for counter current reuse of lime liquors have also been made (1) to reduce the effluent from lime yard.

However with the modern liming systems, involving sharpening agents, recycling systems with replenishment of lime and other additives may be rather difficult to control in regular production.

### Deliming

Considering the beam house operations of deliming and pickling, where the reaction is one of diffusion followed by chemical combination, the concentration gradient plays a vital role. Conventional deliming in drum, involves use of large quantities of water in order to minimise the mechanical action and thus preventing the damage to grain of the pelt which would be tender at this stage. Since the reaction of the deliming agent with collagen is non-stoichiometric, due to the complex nature of the substrate, relatively higher quantities of deliming agent than the theoretical requirement is used.

However it is possible to reduce the float chemicals used for deliming, retaining the concentration gradient as in conventional drum, by the possible use of newer processing equipments which are designed to provide gentle mechanical action in contrast to the drum.

The hide processor and compartmental (Y) drum offers such possibilities.

Based on the design of the equipment, the advantages claimed for the hide processor are:

- Gentle mechanical action, consequently better grain characteristics of final leathers.
- Pumped recirculation system offering better scope for lower liquor hide ratios and hence less effluent.
- Easier loading and unloading of hides.
- Lower power requirement due to reduced starting torque.
- Minimum space requirement.

However, when hide processors are used longer processing time is required.

In order to monitor the efficiency of the hide processor in the operation of deliming, the hides were cut into sides and the rights were processed in the hide processor with the corresponding left sides being processed in the drum. After deliming both the sides were pickled and chrome tanned in the conventional wooden drum.

By conducting a series of experiments, varying the float and the amount of deliming agent used, the savings obtained in chemical and water input in the hide processor are given in Table-3.

**Table-3**  
Savings in chemicals and water in deliming

| Processing Vessel            | % of water used | % of Ammonium Chloride used |
|------------------------------|-----------------|-----------------------------|
| Drum                         | 100             | 1.0                         |
| Hide Processor               | 60              | 0.75                        |
| % Saving (in hide processor) | 40              | 25                          |

The leathers were then analysed for uptake of chromium and the shrinkage temperature of the leathers were determined. The values are given in Table-4.

**Table-4**  
Comparison between control and experiment

| Control                                 | % $\text{Cr}_2\text{O}_3$ | $T_s$ °C |
|-----------------------------------------|---------------------------|----------|
| Drum (Deliming)                         | 3.12                      | 108      |
| Experiment (Deliming in hide processor) | 3.08                      | 109      |

In all these experiments, only one deliming agent has been tried. However the system can be extended to other deliming agents also.

### Pickling

In the process of pickling the hides are treated with acid, in presence of salt solution which is employed to prevent swelling of the protein. It is known that, whilst almost the total quantity of acid used for pickling is taken up by the protein, only 40-45% (3% out of normal 8% of salt based on pelt weight) is taken up by the pelt and the rest is let out in the effluent. This amount of sodium chloride is normally mixed with other discharges of the tannery and adds up to the total dissolved solids of the effluent. Despite the efforts by different researchers, as such there is no economical method for eliminating sodium chloride used in pickling. Similar to deliming, building up of concentration gradient of salt same as that in the conventional drum, using hide processor pickling has been tried.



As mentioned earlier, the hides were cut into sides and rights were pickled in hide processor and lefts in the conventional drum. The sides were then chrome tanned in the conventional drum. The savings in chemical and water input are given in Table-5.

**Table-5**  
**Saving in chemicals & water in pickling**

| Processing Vessel             | % of salt used | % of water used |
|-------------------------------|----------------|-----------------|
| Drum                          | 6              | 60              |
| Hide Processor                | 4              | 40              |
| % reduction in hide processor | 33 1/3         | 33 1/3          |

The wet blue obtained in the hide processor was comparable with control with respect to both chrome fixation and hydrothermal stability. The leathers had also uniformity in colour and were smooth grained in both cases.

The saving in chemical and water input in the process of pickling was as high as 33% and further this system also offers a scope for recycle and reuse of pickle liquor with appropriate replenishment.

### Chrome tanning

Emphasis is now laid on this unit operation because of the increasingly stringent limits applied world-wide to the concentrations of chromium permitted in the effluent. Despite the relative non-toxicity of trivalent chromium (2-5), limits as low as 1 mg/l of chromium have to be met now. With the conventional processing, exhaustion rates of around 70-80% are typical (6), producing a residual chromium concentration in the spent tanning liquor of around 4000 mg/l or more and dilution of this liquor with other tannery effluents might lower this only upto 100 mg/l or more. Apart from the environmental impact, these relatively low exhaustion rates involve substantial economic losses.

In India, it is estimated that about 28,000 tonnes of basic chrome sulphate are being used annually. With the exhaustion rates around 70-80%, chrome tanning salts equivalent to nearly 1800 tonnes of  $\text{Cr}_2\text{O}_3$  are discharged in the effluent (7).

However, there are claims in the literature that chrome exhaustion can be increased to 90-95% using (a) some commercial additives (8,9) (b) recycling procedures (10) (c) high final temperature of tanning (11,13) (d) high final pH (14,15) and (e) usage of self basifying tanning agents (16-18).

The basic rate equation for any process is

$$\text{Rate} = \frac{\text{Driving Force}}{\text{Resistance}}$$

The driving force for the chrome tannage is the concentration of chrome and the simplest way to obtain a high concentration is to use a low float.

In order to combat the poor exhaustion problems, attempts were made to develop low float system with gentle mechanical action of the hide processor. Since the addition of salt in tanning is mainly to prevent acid swelling, effective concentration gradient plays a vital role and hence the total amount of salt used can be reduced considerably in line with the reduced quantity of water used for tanning in the hide processor.

By varying the total float used for tanning, keeping the amount of  $\text{Cr}_2\text{O}_3$  offered constant (1.5% based on pickling weight) a series of experiments have been carried out to explore the possibilities of savings in water and chemical input in chrome tanning. The wet blue leathers were analysed chemically for fixed  $\text{Cr}_2\text{O}_3$  and the shrinkage temperature. The leathers were also determined. The analytical data is given in Table-6.

Though the time required for penetration of chrome is slightly high when hide processor is used, there is considerable

**Table-6**  
**Influence of float ratio in chrome tanning**

|                                   | Drum | Hide Processor | Drum | Hide Processor | Drum | Hide Processor | Drum | Hide Processor |
|-----------------------------------|------|----------------|------|----------------|------|----------------|------|----------------|
| Total Float (%)                   | 100  | 100            | 80   | 80             | 60   | 60             | 40   | 40             |
| % of NaCl used                    | 4    | 4              | 3    | 3              | 2.5  | 2.5            | 1.5  | 1.5            |
| Fixed $\text{Cr}_2\text{O}_3$ (%) | 3.2  | 3.4            | 3.36 | 3.62           | 3.54 | 3.79           | 3.68 | 3.96           |
| $T_s$ , °C                        | 106  | 107            | 106  | 107-109        | 108  | 110            | 110  | 112-113        |
| Time taken for penetration (min)  | 45   | 110            | 40   | 90             | 30   | 75             | 25   | 55-60          |



able improvement in fixation of  $\text{Cr}_2\text{O}_3$  for the same amount of chrome offered. More significantly the wet blue from the hide processor was fuller in substance with smooth grain and uniformity in colour in contrast to the wet blue with a tendency to drawn grain and non-uniform colours as obtained from the drum with reduced float.

Such a system, with improved chrome uptake offers a scope for reduction of amount of chrome used for tanning, if the leathers were required just to stand the boil test. So with this view, using the reduced float system in hide processor, the amount of chrome offered was varied and it has been found that 4% Basic Chrome sulphate was sufficient to impart significant hydrothermal stability to the leathers. The results are shown in Table-7.

**Table-7**  
Variation in uptake of  $\text{Cr}_2\text{O}_3$  with basic chrome sulphate used

|                                                   | 6%              | 5%          | 4%          |
|---------------------------------------------------|-----------------|-------------|-------------|
| % Fixed $\text{Cr}_2\text{O}_3$ T <sub>s</sub> °C | 3.96<br>112-113 | 3.02<br>106 | 2.69<br>102 |

Further, hide processor offers better scope for adopting the high chrome exhaustion techniques like use of high temperature, recycling etc. due to inherent design of the equipment.

#### Pickle-free Alum-Chrome combination tannage

Another possible approach for reduction of chrome in the effluent is to substitute chrome partially by other tanning agents. There is extensive literature relating to the use of aluminium salts in conjunction with chrome salts (19). Apart from improving the grain quality and uniformity, aluminium pretanning has been found to improve uptake of chrome. Aluminium pretanning is supposed to orient and mask the reactive ionised carboxyl groups of collagen. Evidence to this hypothesis is slow release of aluminium which takes place during chrome tanning, resulting in improved uptake and better distribution of chromium. Because the carboxyl groups are pre-oriented, as the pretanning agent is displaced with the formation and more stable protein carboxyl-chromium bond, more cross linking takes place. (20).

When Alum [ $\text{K}_2\text{SO}_4$ ,  $\text{Al}_2(\text{SO}_4)_3$ ,  $24\text{H}_2\text{O}$ ] dissolves in water, hydrolysis takes place, leading to formation of a soluble basic aluminium salt [ $\text{Al}(\text{OH})\text{SO}_4$ ] and an equivalent amount of free mineral acid. When a delimed side enters such a solution, free mineral acid is taken up and fixed by collagen similar to pickling. This results in further hydrolysis of aluminium salt. This property of alum has been advantageously used for combining pickling and pretanning operations,

without addition of external acid for pickling. Potassium sulphate present along with aluminium sulphate can function as a neutral salt, enabling substantial (to an extent of 75%) reduction in use of sodium chloride during pickling.

A series of experiments have been carried out on cow hides to fix the amount of alum required to get a pH of 2.8. After pretanning with alum, the sides were subsequently tanned with basic chrome sulphate, keeping the total mineral oxide (equal to 2%) same as that of conventional chrome tannage with 8% basic chrome sulphate.

The leathers were then checked for the hydrothermal stability and uptake of mineral oxides. The results are shown in Table-8.

**Table-8**

|                                        | Conventional Chrome Tanning | Alum-Pickle Combination Tanning |
|----------------------------------------|-----------------------------|---------------------------------|
| Sodium Chloride used for pickling      | 8%                          | 2%                              |
| Acid used for pickling                 | 1%                          | -                               |
| Amount of Alum used                    | -                           | 8%                              |
| Amount of BCS used                     | 8%                          | 4%                              |
| % $\text{Al}_2\text{O}_3$ fixed        | -                           | 0.8                             |
| % $\text{Cr}_2\text{O}_3$              | 4.2                         | 3.6                             |
| Tensile Strength (Kg/cm <sup>2</sup> ) | 215.5                       | 213.5                           |
| Grain bursting strength (Kg/cm)        | 20.0                        | 18.0                            |

The salient features of this process are:

- elimination of addition of external acid for pickling
- reduction (to an extent of 75%) in use of salt for pickling
- reduction in chrome offered, without impairment in properties.
- higher exhaustion of chrome
- amount of fixed  $\text{Cr}_2\text{O}_3$  very near to that of control despite 50% reduction in input.

#### Newer type of tannages

With the Indian industry emerging as one of the leading exporters of finished leathers and leather goods, from a stage of semi finished leather exporter it is necessary to develop a suitable crust, which would combine the properties of chrome and vegetable tanning materials, overcoming the dis-



advantages of both. Such a tannage would have greater potential in years to come. Extensive work has been carried out at CLRI, for the development of such a tanning system using salts of zirconium and aluminium with small amounts of basic chrome sulphate. The incorporation of basic chrome sulphate is to impart hydrothermal stability to the leathers, while aluminium sulphate is used to impart mineral character to the leather, such as improved dyeability, softness etc. Zirconium on the other hand makes the leathers easily wettable and full like vegetable tanning. Apart from this zirconium due to its inherent nature contributes white colour to the crust. The advantage of this crust over other systems like wet white, which is essentially a reversible pretannage, is that it can be dried and stored in dry condition, after addition of small amount of cationic fatliquor along with tanning salts.

The amount of tanning salts offered and fixation of mineral oxides are shown in Table-9.

Table-9

| Mineral Oxides          | % used (based on hide substances) | % fixed in leather |
|-------------------------|-----------------------------------|--------------------|
| $\text{Cr}_2\text{O}_3$ | 0.82                              | 0.64               |
| $\text{Al}_2\text{O}_3$ | 3.30                              | 2.12               |
| $\text{ZrO}_2$          | 3.96                              | 3.02               |

The advantage of this alternate crust over the existing systems are:

- white base, enabling rich dyeing
- amenable for storing in dried condition, enabling ease of transport and selection
- versatility, as any type of finished leather could be made from such a crust

- possess hydrothermal stability with shrinkage temperature around  $105-106^\circ\text{C}$
- the crust leathers are full in substance offering scope reduction of retanning agents subsequently.

### Conclusion

With the increasing stringent measures on pollution the leather industry is forced to look in for improved environmental tannery processing. The difficulty associated with the tannery effluent are its large volume and high pollutant load. CLRI has developed the following processes to overcome these difficulties by adopting water conservation and improved chemical uptake technologies.

- Counter current recycling of soak liquors.
- Reduction in water and chemical input during deliming and pickling by the use of newer processing vessels.
- Partial substitution of chrome by Alum-pickling.
- Development of alternate crust.

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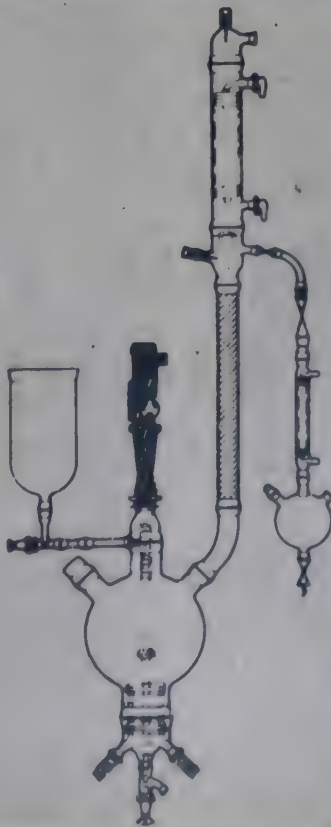
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## LEATHER ABSTRACTS

**RHEOLOGICAL PROPERTIES OF LEATHER**, Istraneme, *American Shoe Making*, 363, (3) 33, 1989.

The rheological i.e. time dependent stress-strain-behaviour considered one of the most significant properties of leather and the goods made from it, therefore, it is of vital importance with reference to shoe manufacture and wear too. This paper describes the recent results of the research done in this field. On the basis of the kinetics of deformation the total strain of leather can be divided into characteristic components and the elastic response of the material to mechanical stresses can be described by the respective moduli of elasticity. Core connection can be formed between the residual strain as a measurable quantity representing the change of structure and mean modulus of the elastic components of strain. After finding the quantitative form of the latter relationship the magnitude of the recoverable and residual parts of strain brought about by certain strains can be predicted.

**LIQUID DYESTUFFS**, H. Trautal and K. Leitermann, *J. Am. Leath. Chem. Assoc. Sep.* (6) 170, 1989.

Modern metal complex dyes dissolved in a solvent/water mixture can be used in all common leather dyeing processes (drawn through feed machine, spraying, printing). The dyeings produced have good fastness to light, migration and perspiration. The formulations required to match various shades can easily be produced by means of reflectance measurements followed by calculation on a personal computer.

**COMPUTER COLOUR MATCH OR PREDICAMENT?** C. Crowther, *J. Am. Leath. Chem. Assoc.*, 84 (6), 184, 1989.

Computer Colour Match Predictions (C.C.M.P.) systems predict accurate recipes provided that all pre-condition are met. The major constraint limiting wider application of C.C.M.P. is inconsistency to the substrate itself. If substrate variability is so treated that each leather must be individually calibrated, the work involved in calibration dyeings outweighs the benefits of rapid recipe formulation.

Towards limiting the variable dyeability of different substrates the ionic charge on three leather types was investigated by an indicator method. This permitted Iso Electric Point (IEP) to be estimated. Subsequent evaluation of dyeing correlated well with the IEP. When the IEP of the three substrates was adjusted to within close limits by suitable treatments before dyeing, the differences in build-up was greatly

reduced. It is believed that this work points towards methods of standardising the dyeability of substrates and hence wider application of C.C.M.P.

**FASTNESS PROPERTIES OF DYED LEATHER INFLUENCED BY DYE AND SUBSTRATE** (nitration and perspiration), H.M. Wachsmann, *J. Am. Leath. Chem. Assoc.* 84 (6) 180, 1989.

Dye chemists and leather chemists have tried time and again to deduce the application and fastness properties of leather dyes from the constitution of the respective dye molecules. This paper shows that some fastness properties are very much limited to the dyestuff properties, while others are more dependent on the substrate as such.

**QUALITY CONTROL IN LEATHER MAKING**, M. Pickles, *World Leather*, 2 (3), 10, 1989.

Quality cannot be inspected into a product. But one has to look at each component from raw materials to chemicals which go to make a piece of leather and minimise the variability. The author in this paper, explains the quality control concept and its application to leather making.

**PROCESSING FOR HIGHER AREA YIELD**, J. Borges, *World Leather*, 2, (3), 14, 1989.

The skill in optimising area yield, without sacrificing applicability and quality is seen in not only compensating losses in one process with more than an equivalent in gain in others, but also in minimising losses and making gains through careful and innovative processing. This paper outlines the author's experiences in improving area yield in bovine upper leathers.

**PREPARATION OF POLYVINYL CHLORIDE LACQUERS AND THEIR USE IN LEATHER FINISHING**. N.K. Chandrababu, S. Rajadurai and D. Ramasamy, *Leather Sc.*, 34, 115, 1987.

Internally plasticised polyvinyl chloride lacquers have been prepared by graft copolymerisation with acrylics. The products thus obtained were evaluated for use as topcoat in leather finishing with regard to flexural endurance, performance in the mines test, wet and dry rub fastness, gloss and feel properties. The performance characteristics of the products indicated that some of the formulations could be successfully exploited as topcoat in the finishing of leathers.



# NEWS FROM ABROAD

## FIRST SINO-US TANNERY

Wuxi about 80 miles from Shanghai is the location of the first joint venture between the Chinese and Americans in leather making. After three years of negotiations and preparations, Wuxi Chi Mei Leather Company was officially opened in May immediately following the Hong Kong Leather Fair.

## HIGHER AREA YIELD

Scandinavian tanneries have conducted trials on a co-operative basis, under the aegis of their Leather Research Station at Copenhagen. With the objective of improving area yield the tanneries have benefited from this work. Norwegian tanners, for instance, have increased yields by 6 per cent and it has resulted from persistent application to the problem at all stages of processing.

-- *World Leather*, 2, (3), 1989.

## FARMING IN BOLIVIA

A notable feature of conventional Bolivian tanning in recent years has been the rise in livestock numbers, principally cattle which have increased by 44 per cent between 1980-85. Estimates for 1985 are: Cattle 5.9 million, pigs 1.1 million, sheep 9.4 million and goats 1.2 million.

*World Leather*, 2, (3), 1989.

## U.S. INDUSTRIAL NETWORK 1988 Current-Dollar Industry Shipments

| Industry                    | Shipments | % of Leather group total |
|-----------------------------|-----------|--------------------------|
| Non rubber footwear         | 4.56      | 51.6                     |
| Leather tanning & finishing | 2.19      | 24.8                     |

|                              |      |       |
|------------------------------|------|-------|
| Luggage                      | 0.75 | 8.5   |
| Small Personal leather goods | 0.42 | 4.8   |
| Gloves & Mittens             | 0.22 | 2.5   |
| Leather wearing apparel      | 0.19 | 2.1   |
| Total                        | 8.84 | 100.0 |

## SHIPMENTS OF LEATHER & LEATHER PRODUCTS

1988-89

(in millions of dollars except as noted)

| Industry                          | Percent Change 1988* | Percent Change 1987-88 | Percent Change 1989** | Percent Change 1988 |
|-----------------------------------|----------------------|------------------------|-----------------------|---------------------|
| Leather tanning & finishing       | 1421                 | 5.7                    | 1478                  | 4.0                 |
| House slippers                    | 164                  | 10.1                   | 175                   | 6.0                 |
| Men's footwear, except athletic   | 1975                 | 10.0                   | 2113                  | 7.0                 |
| Women's footwear, except athletic | 1447                 | -0.5                   | 1491                  | 3.0                 |
| Footwear except rubber n.e.c.     | 425                  | -1.2                   | 453                   | 1.0                 |
| Leather gloves & mittens          | 197                  | -4.4                   | 201                   | 2.0                 |
| Luggage                           | 642                  | 0.5                    | 654                   | 1.0                 |
| Handbags & purses                 | 423                  | 2.9                    | 431                   | 1.0                 |
| Small personal leather goods      | 353                  | 0.3                    | 361                   | 2.0                 |
| Leather & Sheep-lined clothing    | 139                  | 1.5                    | 141                   | 1.0                 |
| Total                             | 7186                 | 3.9                    | 7498                  | 4.0                 |

\* Estimated

\*\* Forecast

*The Leather Manufacturer*, 107, 2, 1989



## INDIAN LEATHER SCENE

### STEEP RISE IN LEATHER GARMENT EXPORTS

The leather garment sector in the country has recorded a spectacular growth. This was attributed to the substantial expansion in its production base and a phenomenal rise in exports the last three to four years. The number of leather garment manufacturing units has risen from just 22 in 1982 to about 125 by 1988-89. These units are spread all over the country, the majority of them concentrated in Tamil Nadu, Maharashtra, Delhi, M.P. and U.P. Besides these units — which fall under the category of small-scale sector — are medium and large mechanised and totally export-oriented, there being no demand in the domestic market.

As per official estimates, the production capacity has gone up by about seven lakh pieces to around 18 lakh pieces in 1988-89, from 11 lakh pieces 1986-87. The break-up of capacity production centre-wise being, Madras 35,000, Bangalore 30,000, Bombay 25,000, Pune and Hyderabad 15,000, New Delhi 10,000, Delhi 30,000 and Kanpur and other places 10,000 pieces per month. The exports in this sector have recorded a striking rate of growth during the first four years of the Seventh Plan and have far exceeded the target of Rs. 39 crores in terms of value and 7.22 lakh pieces in terms of quantity laid down for 1985-90 plan period. According to official data, the exports of leather garments rose from Rs. 9.46 crores in 1984-85, that is by the end of the Sixth Plan to Rs. 16.72 crores in 1985-86, to Rs. 62.26 crores in 1986-87, to Rs. 105.72 crores in 1987-88 and touched an all-time high of Rs. 166.15 crores in 1988-89. The forecast for the current fiscal year put the figure at Rs. 200 crores.

The significant increase in exports is mainly attributed to the brisk demand from major importing countries of the U.K., Federal Republic of Germany, the U.S. and France, coupled with higher unit value realisations. In 1988-89 the average unit value realisation was placed at Rs. 860.19 per piece. This apart, Indian exporters have explored some new markets in the Netherlands, Denmark, Spain, Switzerland and Sweden. Among other countries buying Indian leather garments are U.D.R., Italy, Canada, Japan, the U.S.S.R., Ireland, Greece, Finland, Hong Kong and Australia.

### PARTICIPATION IN OVERSEAS FAIRS: TFAI POLICY CRITICISED

The Indian Leather Products Association (ILPA) has ultimately won the battle against adversaries in obtaining a place

in the forthcoming Offenbach fair in West Germany. After much hassles, it is finally participating in the August international leather goods fair being organised by Offenbach. ILPA's entry into the Offenbach fair was not a smooth one as has been reflected in the presidential speech given by Mr. S.S. Sawhney at the association's second annual general meeting inaugurated by the West Bengal Chief Secretary, Mr. Tarun Datta, at Calcutta on July 31. Mr. Datta said that the government has undertaken a study to identify those industries which are not beyond redemption and could be revived with the help of modernisation and other managerial services and leather is one such industry which is getting priority.

Referring to the association's participation in the West German fair, the ILPA president said that it has ultimately managed to obtain a clearance from TFAI for the Offenbach fair. "It is almost somewhat intriguing that notwithstanding a permanent stall being allotted to ILPA by the fair organisers, TFAI has only provided a one-time clearance to the association for 1989. This would naturally give rise to a few questions on the fundamental principles of TFAI's policy in respect of participation in international trade fairs and particularly fairs such as Offenbach where TFAI does not itself take part", remarked Mr. Sawhney.

TFAI should not be rigid about recommending the participation of industrial organisations such as ILPA in the few fairs that they are able to take part in. A relaxed policy on the part of TFAI, the ILPA president pointed out, would only serve to complement the industry's efforts in export marketing. The country today is facing staggering balance of payments deficit with the terms of trade having been adversely affected over the last two years by 22.5 per cent on an average.

Against this backdrop, said Mr. Sawhney, all-out efforts should be made to augment exports and as part of the strategy for a continued export thrust, rational and liberal norms for export-oriented activities should be devised. An active participation in overseas trade fairs would certainly be a part of this strategy. ILPA considers to set up its own office in New York. This office would have dual objectives of functioning.

### MUCH SCOPE FOR LEATHER EXPORTS TO JAPAN SEEN

There is immense scope for the exports of leather to Japan which is a high potential market for leather goods, provided



the Indian exporter sticks to quality and delivery schedules, said Mr. Shoskau Tanaka, Consul-general of Japan, while inaugurating a seminar of leather apparel market in Japan organised by the Council for Leather Exports and Japan External Trade Organisation (JETRO). Replying to a complaint on the high tariff rates, he said that only finished leather and footwear had high tariff rates. All other leather products had nominal rates because the competition was so severe.

Exports of leather to Japan has increased from Rs. 67.75 million in 1985-86 to Rs. 362 million in 1988-89. The exports of leather garments was Rs. 14 million in 1985-86 and had increased to Rs. 17.28 million in 1988-89. India's share contributed to hardly 0.2 per cent, said Mr. C.K. Duraivelan, regional chairman, Council of Leather Exports. He appealed to the Japanese consul for concessions in quotas and import duty for finished leather and leather products.

#### REPORT READY ON TN LEATHER GOODS SECTOR WAGES

The advisory committee constituted by the Tamil Nadu Government in April last year to recommend minimum wages in leather goods and footwear industry, has finalised its report. The committee, it is learnt, has classified the workers into three categories — skilled, semi-skilled and unskilled — for the purpose of fixing the wages on a monthly basis. It has also worked out a dearness allowance formula applicable to all the categories. According to the recommendations, a skilled worker will get a minimum monthly wage of Rs. 1200, semi-skilled Rs. 1050 and unskilled Rs. 900. It is understood that while the committee could unanimously agree on classification in respect of as many as 65 operations, a decision has yet to be taken in the case of another 11 operations.

The wages are linked to the average consumer price index for the Madras City in 1987 and fixed at 735 points. The DA formula, as worked out by the advisory committee, envisages payment of Rs. 1.20 per point increase. There will be a half-yearly review of DA payment on April 1 and October 1. The committee was chaired by the Deputy Labour Commissioner and comprised of representatives of both the employers and the employees. The report will now go to the State Government for a final decision.

#### LEATHER GARMENT EXPORT CAN TOUCH \$100 M: CLE CHIEF

Leather garment exports from the Eastern Region can touch \$100 million within the next three years if manufacturers gear up facilities. Stating this in Calcutta at a seminar on leather garments export organised by the Council for Leather Export (CLE), the council executive director, Mr. A. Sahasranaman said the region was ideally suited for garment manu-

facture because of the trained labour and availability of hide. However, Mr. Sahasranaman said entrepreneurs must make necessary investments for modernising process facilities if the region was to produce international quality garments. At present, garment production is insignificant in the region with both the tanneries and manufacturers preferring to produce leather bags.

From total Indian garments exports of Rs. 9 crore in 1984-85, exports jumped to Rs. 160 crores in 1988-89. Visiting the development, Mr. Sahasranaman said it was paltry compared to the potential. He identified the Japanese market as an area for export thrust. Japan imported \$400 million worth of leather garments in 1988-89 of which South Korea accounted for \$330 million. Pointing out that India exported garments worth \$2 million last year to Japan, he urged manufacturers to go all out to tap this developing market. In fact, Indian export of leather garments has assumed significance in the British market where it accounted for \$40 million of the UK's total import of \$100 million in 1988-89. In the US, India's share in total import of \$800 million was \$20 million, while the country accounted for \$4 million out of West Germany's total leather garment import of \$800 million, considering that India had both raw materials and infrastructure. The aim should be to achieve a quantum jump in exports, he added.

Mr. Sanjoy Sen, President, Indian Leather Technology Association, stressed on the need to develop brand identity for Indian value-added leather products, pointing out efforts would have to be made to increase the unit value addition due to shortage of raw hides. He advised entrepreneurs to tap the fashion market for leather. Referring to the eastern region, Mr. Sen asked entrepreneurs to move from the seasonal attitude to production. Manufacturers also asked to renovate their factories as international competition would depend on manufacturing facilities.

Mr. M. Goldman of Palm Beach Corporation, a US leather manufacturing and importing company with sales in excess of \$1 billion, urged Indian businessmen to form consortiums of five to ten members for meeting the bulk requirements of US importers. Mentioning that South India today accounts for 80 per cent of the US leather garment market, Mr. Goldman said there was no reason why India could not increase its share. In fact, he opined that a consortium approach together with strict check on quality could increase India's share in the US market to 25% by 1995.

However, Mr. Goldman cautioned exporters against defaulting in shipment obligations and quality norms which could affect long-term export prospects. This has assumed special significance as a spate of mergers and takeovers has reduced the number of actual importers, he added.



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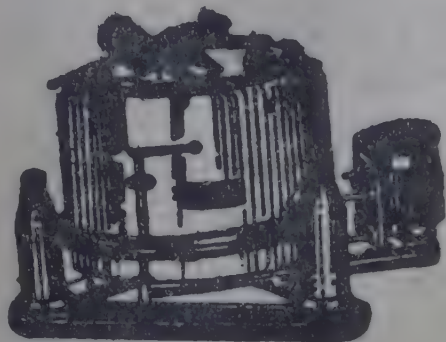
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## Plastic Markets Abroad

### POLYMERS PRICES SLIDE AS SUMMER SLOWDOWN LOOMS

As the traditional summer slowdown approaches, the polymers market is getting little respite. A number of grades have slipped into a freefall scenario, under the double blows of strong de-stocking and cheaper imported polymers.

Observers are split over the effect of the July holiday period for northern Europe and the August break for southern Europe. Convertors, especially shutdown their operations, drastically reducing demand. Over the last two summers the market remained tight, so the impact of the slowdown was minimal. Producers kept polymer units running flat out to rebuild stocks and meet renewed convertor demand in September.

Many producers feel the Summer period will prove a watershed for the present difficulties affecting the polymers market. It is noted that many grades are showing good sales for June, giving strong indications that de-stocking is coming to an end, as predicted last month. This could mean the market is rapidly reaching the bottom of a cycle, with convertors entering the market discreetly to buy before numbers shift upwards. Although based mainly on speculation, producers feel some positive indications are appearing.

Presently ldPE and lldPE are suffering most under present market conditions. Imports from Latin America and Eastern bloc are undermining prices. While increased trader participation is also bringing numbers down. Some producers are preferring to sell quantities of product to traders

rather than cut capacities. This invariably adds to a downward price spiral as traders will undercut producers to make margins.

Observers stress the European lldPE market is now stable and mature, with few opportunities for new growth into unexplored product areas, leaving it more susceptible to de-stocking. Although lldPE is a newer product, which has not fulfilled its growth potential, lower grade material is intrinsically linked to ldPE. Many convertors blend the two products and so volume substitution from one to the other takes place. If prices for ldPE drop, then butene-based lldPE will fall to enable it to compete.

The worldwide calamity afflicting ldPE is reflected in prices

which have crashed to DM-.40-1.55/kg. In past downwards shifts, players have been able to ease the burden by switching to export markets. This has not been available this time.

LldPE butene-based material has suffered a similar fate to ldPE, dropping to the level of DM1.40-1.55/kg. The market feels prices are near to bottoming out. With derivative shutdowns planned for quarter three and four, production will fall, adding to slowly rising producer confidence.

After a short period of relative stability, polypropylene prices are again facing rapid price erosion. The market had appeared to have adapted to the 350,000 ton of additional capacity coming into the market in quarter one. Now speculation for a further 250,000 ton.

### Plastics price report (DM/kg)

| Product                                        | Market Price |           |
|------------------------------------------------|--------------|-----------|
|                                                | June         | July      |
| <b>High density polyethylene (hdPE)</b>        |              |           |
| Injection moulding                             | 2.00-2.15    | 1.85-2.10 |
| Film (extrusion) grade                         | 2.05-2.10    | 2.10-2.20 |
| Blow moulding                                  | 2.10-2.15    | 2.05-2.10 |
| <b>Linear low density polyethylene (lldPE)</b> |              |           |
| Film grade (butene-based)                      | 1.85-1.90    | 1.40-1.55 |
| <b>Low density polyethylene (ldPE)</b>         |              |           |
| Film grade                                     | 1.90-1.95    | 1.40-1.55 |
| <b>Polypropylene (PP)</b>                      |              |           |
| Raffia grade                                   | 1.70-1.80    | 1.55-1.60 |
| Injection moulding                             | 1.75-1.80    | 1.60-1.80 |
| Copolymer                                      | 1.95-2.20    | 1.90-2.10 |
| <b>Polystyrene (PS)</b>                        |              |           |
| General purpose                                | 2.55-2.70    | 2.50-2.70 |
| High impact                                    | 2.65-2.80    | 2.05-2.80 |
| <b>Polyvinyl chloride (PVC)</b>                |              |           |
| Suspension                                     | 1.82-1.88    | 1.82-1.88 |

The left hand column gives a guide to price levels for large to medium size buyers and for general purpose grades in June.

The right hand column shows the latest prices in July.



of new capacity, due to start-up in the second half of the year, is dragging prices down.

The feedstock argument appears to be on the agenda again, as buyers and sellers have failed to reach a settlement on quarter three polymer grade propylene prices. Everyone accepts some fall-back on quarter two numbers, the disagreement is by how much. Propylene sellers argue that with second half cracker shutdowns, production will be reduced and should be reflected in contracts.

Producer reactions to falling polypropylene prices have been to announce capacity alterations. ICI has announced the closure of 40,000 ton of older capacity, while Hoechst and Appryl are believed to be considering reductions in production. Raffia grade product has now slumped to 1.55-1.60/kg, although lower numbers are rumoured to be available. Injection moulding grade has also come under pressure, dropping to DM1.60-1.80/kg. Copolymer has stood up well, slipping only slightly to DM1.90-2.10/kg.

HdPE which had shown great resilience to price erosion, is now coming under some pressure, although this has been limited to general purpose injection moulding. Imports of cheaper injection moulding product has been strongly targeted towards Europe. It is believed many plants with swing capabilities have switched from film ldPE and lldPE to hdPE.

Adding to the difficulties provided by import material, that would have gone to the Far East if that market had been more lively, is de-stocking. Convertors have undergone a massive de-stocking operation since the end of quarter one, which observers believe must be coming to an end. Again the effect of derivative maintenance

turnarounds in quarter three and four is cited as reason why polyethylene availability will decrease, putting a brake on current drops.

HdPE injection moulding prices are showing the strain of import competition dropping to DM1.85-2.10/kg. Film grade material is relatively stable at DM2.10-2.20/kg, with DM2.05-2.10/kg being quoted for blow moulding.

Polystyrene, another product which has avoided any real price erosion, is beginning to feel the heat. US ideas are strongly affecting European price ideas. With a pipeline effect developing, due to lack of export sales, US prices seem set to drop away. In Europe flagging exports and the psychological effect of the fall in monomer prices is threatening prices. General purpose grade has slipped by some 5pf/kg, down to DM2.50-2.70/kg, with high impact product more stable at DM2.65-2.80/kg.

PVC is proving to be rock solid regarding any price movements. Supply and demand are said to be well balanced, with potential for tightening. Suspension grade material is unchanged at DM1.82-1.88/kg.

#### SUMITOMO SIGNS PACT

Sumitomo Corp. has opened a channel of access for Japanese firms to nearly all UK anti-cancer drug technology. In a deal signed by Sumitomo and the commercial arm of the Imperial Cancer Research Fund, the Japanese firm has the exclusive right to act as an agent in Japan for licensing ICRF-funded discoveries.

The Japanese major is also able to arrange for Japanese companies to carry out development and clinical trials of ICRF-funded drug technology.

#### ACNA CLOSES PLANT

Montedison's organic intermediates operation, Acna, has had to close a plant for six months because of pollution risks. Italy's environment minister, Giorgio Ruffolo, was not satisfied by the company's safety guarantees for the plant in Cengio, northern Italy, though Montedison signed an agreement with the government last September pledging to stem the leak of chemicals through the subsoil at the plant.

Environmentalists continue to lobby for permanent closure of the plant, which makes dyes, medicines and pesticides. Acna has annual sales of L200bn (\$145m).

#### GIST-BROCADES MAKES MERGER BID

Amsterdam-Based biotechnology and healthcare concern, Gist Brocades, is finalizing an agreement to buy rival Dutch company ACF Holding. The tender offer has been valued at Dfl1.240 (\$114m), encompassing Dfl.2 cash/share, one common share and a five-year warrant for another ACF share. Final terms are due to be declared in a few days.

The main advantage of the purchase, said a Gist spokesman, for Brocacef Holding, the companies' 50:50 joint venture: "The 1990s European market will open borders and there will be competition for Brocacef." The merger would enable Brocacef to counter this competition more effectively and aid continued expansion.

Some observers see the bid as a defensive measure, to prevent competitors from acquiring ACF. The market value of Gist's shares have fallen, while, ACF's have risen substantially.



## Environment

### ICI INVESTIGATES AMMONIA LEAK

ICI is still trying to discover the cause of the ammonia leak which killed two workers at its fertilizer complex at Billingham, Cleveland. The accident is believed to be due to a mechanical failure, and has been described by an ICI spokesman as the first such incident at the site.

The investigation, set up immediately after the incident, has so far established that a failure in a pump supplying ammonia to the No. 5 urea plant caused the pump to break open, releasing ammonia to the adjacent area.

ICI said there was an immediate toxic alert but it was too late to warn the workers who were near the plant which supplies the company's fertilizer and urea formaldehyde resin operations.

Around 60 people are currently involved in the investigation which is being lead by Sandy Anderson, ICI Teesside's operations manager. Attention is now being focused on the cause of the pump failure, and the investigation is expected to be completed shortly.

This incident is the first to involve fatalities at ICI's Billingham site since 1986 when one worker was killed at another part of the plant.

Last year ICI recorded 2.9m hours without a lost-time accident at Billingham, with over 1m hours being recorded so far this year.

### ATTWOODS ACQUIRES U.S. WASTE GROUP

Waste disposal major Attwoods has acquired the Florida operations of Laidlaw Transportation,

the Canadian based waste management and bus company. The deal will eliminate competition between the two companies in the U.S. Laidlaw is described by observers as one of the dominant forces in the U.S. waste disposal industry. Attwoods on the other hand operates mostly in Florida.

The deal involves four operating units located in Tampa, Jacksonville, Palm Beach and Port St. Lucie, involved in the collection, disposal and reclamation of solid waste, as well as one small landfill site operated under contract by Laidlaw. In the last financial year Laidlaw returned a \$3.82m pretax profit on sales of \$24.06m.

In January this year, Laidlaw gained a 28 per cent share in the UK-based Attwoods from the electronic surveillance and vehicle auction concern, ADT. This deal increases its share to 34.2 per cent.

In addition to receiving 25.44m new Attwoods preference shares valued at \$57m, Laidlaw will also receive in cash most of the value of any stock and debtors at the time of completion of the deal together with the cost of any equipment purchases since March this year.

The deal requires approval both by Attwoods other shareholders and the local municipalities in Florida.

### BASF UNVEILS PLANS FOR THE ENVIRONMENT

BASF has unveiled its plans for environmental protection. The emphasis of the Ludwigshafen group's environmental programme, on which BASF says it spent DM1.4bn (\$764m) in 1988, is on

avoiding, reducing and recycling production residues, says managing board member Dr. Detlef Dibern.

The figure includes DM850m to operate antipollution plant and equipment, DM288m on environmental research and DM253m on new antipollution facilities. The group aims to spend another DM 2.5bn on environmental protection over the next 10 years.

Dibern estimates BASF recycles around 750,000 ton of potential pollutants annually. Six new production processes developed by the group will allow another 300,000 ton of waste to be treated thermally and used as an internal energy source, he says.

### GREENPEACE INVADES

More than 200 Greenpeace activists surprised security personnel at Hoechst on 5th July and occupied segments of the Frankfurt works in protest at the production of chlorofluorocarbons.

The protesters gained access to the complex via the water, docking their boat at a Hoechst landing pier. Inside the works, they unveiled banners bearing inscriptions such as "Hoechst — another name for skin cancer" and called for an immediate end to production.

Hoechst produces about 70,000 ton/year of CFC, accounting for 7 per cent of global manufacture. The company reiterated its commitments to phasing out production by 1995, but added an immediate halt to manufacture is not feasible as some alternatives for CFC applications are not available.



## Technological Scene Abroad

### DISAPPOINTMENT OVER WASTE MANAGEMENT DECISIONS

The UK government's decision not to restructure its waste management industry has been described as "disappointing" by Sir Hugh Rossi, chairman of the government's environment committee.

In March this year the committee issued a report urging the state to replace the existing structure of waste disposal authorities with fewer new authorities under the control of an environmental protection committee. However, Nicholas Ridley, then secretary of state for the environment, rejected the idea, claiming that waste management practices in the UK are environmentally safe.

"I am disappointed that the government has not looked at that proposal more seriously, because it is something that the industry itself is requiring," Rossi told an IChemE conference on waste management.

"We only know when something like Moscow happens or another Love Canal in the US. The warning signs are there but nobody is carrying out a monitoring of our land fill. Nobody knows how many contaminated land sites we have."

Henry Pullen, speaking for the national association of waste disposal companies added that the government's proposal to retain existing localized structures did not take into account the cost and complexity involved in such a

waste with domestic waste in the same landfill — should not be out-lawed, as is being recommended in Europe. "They now recognize that it is possible to have co-disposal provided the site is properly engineered and the necessary precautions taken," said Rossi.

He warned against the over-regulation that happened in the US making the cost of providing waste management so expensive that some waste producers found it more economic to export the problem to other countries including the UK.

However, Malcolm Pratt, director of UK consultancy firm Cremer and Warner, said that ensuring the waste producer bears the cost and responsibility of waste management — the duty of care — will mean costs are assessed realistically in the future and encourage the minimization of waste production.

"Costs will determine the progress in waste technology. Research into waste technologies is generally limited to techniques for dealing with very toxic materials. Expenditure on such research is low because, as yet, the rewards are small," said Pratt but went on to note that although some firms had been denied planning permission for an incinerator because of public opinion, if those companies appealed, the decision might now be overturned.

Rossi believes a European definition of waste is essential. "I don't think it follows that every-thing that is the byproduct of in-

### SPD ATTACKS WEST GERMAN LAW

West Germany's Social Democratic Party (SPD) plans to ask the Bundestag to "put more teeth" into the revised chemicals act when it comes up for a vote in the West German parliament this autumn.

At the same time, the SPD has criticized the cabinet — which has already approved the revision — for "watering down" the original amendment drafted by the federal environment ministry. According to the opposition party, "Three years after the fire and chemicals spill at Sandoz, the federal government has still not drawn the necessary conclusions."

The party's concept for the new chemicals act, on which the SPD has coordinated with the chemical workers' union, IG Chemie-Papier-Keramik, calls, among other requirements, for the registration procedure currently applied for new chemicals to be replaced by an approval procedure similar to that applied to pharmaceuticals in which environmental and consumer groups would given a voice.

Products believed to be destructive to the ozone layer could be made ineligible for registration. The SPD would also require the chemical industry to supply basic data on the properties of products every two years. The party would also like to see the Bundestag establish a committee to study the long-term effects of new chemicals and chemical technologies.



fluorocarbons, together with a ban on the consumption of halogens and other chlorinated hydrocarbons. These they consider to be destructive to the ozone layer.

### EPICHLOROHYDRIN IN BALTIC SHIP FIRE

Fire Brigades and detoxification experts were brought into action along West Germany's Baltic coast some ten days ago to fight a fire on board the Dutch freighter, the Ostzee.

The vessel, en route from Rotterdam to Leningrad, was carrying 4,000 ton of epichlorohydrin in 250 litre containers which were in danger of exploding. The chemicals were being shipped to the Soviet Union from Dow Chemical's Stade plant.

The ship was originally towed from Cuxhaven to Brunsbüttel for unloading. A member of the German detoxification team was admitted to hospital after inhaling epichlorohydrin fumes which can cause lung damage. The 14 man crew of the Ostzee was also admitted to hospital for observation.

The vessel was, however, moved a further four kilometers to Neufeld because of fears that the cargo might react with radioactive fuels on board another ship in Brunsbüttel harbour.

After detoxification, the vessel was returned to Brunsbüttel for reloading. Damaged epichlorohydrin containers were returned to Stade for disposal.

### ROCHE GAINS KOREAN ANTIBIOTIC

Swiss Pharmaceuticals company Hoffmann-La Roche has acquired worldwide production and marketing rights to a broad spectrum antibiotic for \$5.5.

The third generation antibiotic, called Triaxone, was developed by South Korean company Hanmi Pharmaceuticals in 1987, a spokesman for the South Korean government said.

A material process patent for Triaxone has been approved or is pending in 20 countries including the US and West Germany, according to the Korean health and social affairs ministry.

### RHINE ANALYSTS SEE NEW PROBLEM

A new problem has been identified by West German waterworks and local authorities along the Rhine in their attempts to meet the new EC water pollution limits.

Analysts for the waterworks are having problems distinguishing the sodium salt of diacetone ketogluconic acid, used as a plant growth regulator, from the acid itself which is a byproduct of vitamin C production.

Hoffmann-La Roche, a major vitamin C producer, has said it will be able to remove the nontoxic acid from its waste water discharges, but West German producer E Merck is said to be experiencing difficulties in its removal.

### SMITHKLINE SANCTIONS BEECHAM MERGER

The Last Hurdles in the path of the merger between SmithKline Beckman and Beecham have been cleared, allowing the move to go ahead as planned. The new group, SmithKline Beecham is the world's second-largest pharmaceuticals and OTC medicines company, and is fourth-largest in animal health products. It will have combined sales of over £3.7bn/year (\$6.25bn).

In recently, the UK high court sanctioned the merger and SmithKline shareholders voted 99 per cent in favour of the amalgamation at a special meeting in the US. SmithKline shareholders are to receive an equity distribution making them equal owners with Beecham shareholders in the merged company. Beecham shareholders approved the merger last month.

SmithKline Beecham's activities will be in four areas: pharmaceuticals; consumer brands; animal health products; and laboratory services. It will employ over 5,000 people in R&D for new medicines, with an annual budget of more than £300m.

### EUROPEAN PHOSPHATE DISPUTE HOTS UP

The Dispute between Rhone-Poulenc and West Germany's Henkel over phosphate-free washing powders has now reached the courts.

Rhone-Poulenc announced recently that it has decided to take Henkel to court over a television advertisement for its phosphate-free powder, Le Chat.

Henkel describes the powder as environmentally safe, a claim which, according to Rhone-Poulenc, has no scientific basis and could constitute misleading publicity, an offence in France.

Rhone-Poulenc has been drawing public attention to a scientific study which claims phosphate-free washing powders actually contribute to the proliferation of algae or eutrophication. The company says its move against Henkel is prompted more by a wish to prevent unsubstantiated ecological claims than by business interests.



## Biotechnology

### DENMARK GIVES GREEN LIGHT TO INTERLEUKIN-2

Denmark has granted marketing approval to Cetus Corp's anticancer drug, interleukin-2, to treat advanced kidney cancer. The US biotechnology firm has also received US patents covering Macrophage-colony stimulating factor (M-CSF) and PEG M-CSF.

The Danish decision is hot on the heels of the recommendation from the EC's committee for proprietary medicinal products. Commenting on the approval, Cetus president and ceo, Robert Fildes said: "We are excited to receive this positive news from Denmark and look forward to hearing from several other EC countries in the near future."

Fildes added that EuroCetus, Cetus' Amsterdam-based subsidiary, has agreed that Finland's Farnos will market and sell the drug in Denmark and other Scandinavian countries when approved. Cetus intends to sell the drug directly in some EC nations, and has set up marketing operations in France, Italy, Spain, West Germany and the UK.

Cetus is waiting for US approval as a kidney cancer treatment, and hopes to receive the green light within 12 months. Getting the first approval is a key step as both US and EC regulations allow a drug to be prescribed for any ailment once it has been approved for one indication.

Switzerland's Hoffmann-La Roche stands to benefit from the Danish decision. Under a deal signed

at the end of last year, Cetus and Roche averted a protracted patents battle by signing a cross-licensing agreement.

The US patent and trademark office awarded two patents which Fildes describes as fundamental in the coverage of M-CSF and providing Cetus with a very broad position in the development of the protein.

M-CSF stimulates production of white blood cells which play an important role in the body's defences. Clinical animal studies suggest the protein may be useful in wound healing and restoring white cell populations.

### SQUIBB SIGNS \$50M R&D DEAL

The US pharmaceutical concern Squibb Corp is to spend over \$50m over the next 12 years supporting genetics research at the Louis Pasteur University in Strasbourg, France.

The research will centre on the basic genetic mechanisms involved in diseases such as cancer, and Squibb will have access to discoveries supported by its funding and receive patent and licensing rights accordingly.

According to Squibb chairman and ceo, Richard Furlaud, the research, which will be directed by Professor Pierre Chambon, a molecular biologist at the university, will not be aimed at the development of any particular drugs, but more to support projects in basic molecular biology.

As part of the deal, Squibb will also contribute towards the construction of a research facility at the university with completion scheduled for 1991-92.

This latest move follows similar agreements with Massachusetts General Hospital in Boston, the US, and Oxford University in the UK, where, as part of a \$36m agreement signed in late 1988, Squibb is supporting the construction of a neuroscience research facility.

The moves are all seen as being designed to expand Squibb's basic research capabilities.

### CONNAUGHT FACES TUGH FUTURE

Canada's premier vaccine producer Connaught Bio-Science faces a tough time in the coming year, according to Brian King, the company ceo. Backing his board's decision to approve the proposed merger with France's Institut Merieux, King said global competition from drug multinationals with big budgets was forcing Connaught into the merger.

"The intensifying competitive environment, the need for high R&D spending and the absence of a significant new product introduction means it will be hard to show the kind of earnings growth we have experienced recently," added King.

The merger, which must be approved by shareholders and Investment Canada, will give Merieux control of a Dutch-based company formed by combining human health businesses of both firms. Connaught's Montreal-based contract research arm, Biomedical Research Laboratories, is not included in the deal.



# News About New Projects

## IDS OUT FOR MALAYSIAN PP AND MTBE FACILITIES

Plans for a Ringgit 800m (\$300m) grass roots polypropylene/MTBE complex in Malaysia are moving ahead. Polypropylene Malaysia Sdn Bhd (PPM), a joint venture between Petronas (55 per cent), Idemitsu Petrochemical (35 per cent) and Neste Oy (10 per cent) has invited contractors to prequalify for the construction of a Unipol process polypropylene plant on the Gebeng industrial estate, Pahang state.

Due on stream in the spring of 1992, the facility will be designed to produce 80,000 ton/year of PP and include the entire product range of homo, random and impact copolymers. Sources in Malaysia said that the Union Carbide/Shell Oil (USA) gas phase Unipol process was selected on technical and economic grounds, following careful evaluation of a number of leading PP technologies.

PPM will source propylene feedstock for its Ringgit 300m plant from another joint venture the three partners have set up. MTBE Malaysia Sdn Bhd, in which Petronas holds 60 per cent, Neste 30 per cent and Idemitsu 10 per cent, is already prequalifying contractors for the construction of a Ringgit 500m complex which will comprise units for propane and butane dehydrogenation and 300,000 ton/year of MTBE.

Two pipelines will link Terengganu, 100 km north of Gebeng estate, and the new complex. These will carry field butane and propane from an upstream facility belonging to Petronas. Using UOP technology, the two raw materials will be fed into one reactor to produce butylene and propy-

lene. The butylene will be combined with some 110,000 ton/year of methanol, probably from Malaysia's existing facility, to yield 300,000 ton/year of the gasoline blending component. A third of the output will be earmarked for export, mainly to the South East Asian and Pacific Rim countries. The joint venture will use the IFP MTBE process in combination with that offered by CR & L.

The PP complex will comprise propylene treatment, hydrogen purification and polypropylene unit; utilities; and offsites. Contractors will be expected to provide detailed engineering, procurement, construction and commissioning on a fixed, non-escalating lump sum prices basis. Bids for a portion of the facilities only will not be entertained, according to Petronas. Although Carbide works with around half a dozen bidding contractors, other companies are expected to be involved. Bids for the complex will be issued in November of this year.

Thirty per cent of the investment will be financed from share capital and 70 per cent from international and domestic loans. The projects represent Petronas' first petrochemical joint ventures with international partners.

When the new PP plant comes on line, in early 1992, Malaysia will be consuming around 60,000 ton/year of PP. A part of the market, however, will be supplied by another PP plant planned in the country. JGC of Japan recently won a contract to build a 100,000 ton/year PP unit for Titan Polypropylene Sdn Bhd, a joint venture between the Chao Group of Taiwan and Himmont. This facility, due on stream in two years' time, will be located at Pasir Gudang, Johore state.

## DOW CORNING/CABOT IN WELSH SILICA JV

Dow Corning, the world's largest producer of silicones, is negotiating with Cabot Corp on the construction of a fumed silica joint venture plant at its Barry South Wales complex. Construction of the \$40-50m facility is expected to begin next year.

Sources at Dow Corning have confirmed that discussions are in progress but added that Cabot is not the only fumed silica producer holding talks on the project and Barry is not the only site being considered. A decision is expected early in the fourth quarter of this year.

Dow Corning is a major consumer of fumed silica. Other suppliers of the agent include Degussa and Wacker.

Fumed silica is used as filler in tooth paste and as thickening agent in sealants. It is also used to reinforce silicone rubber where the material needs to withstand high temperatures in structural applications. The products are made by burning chlorosilanes which Dow Corning makes at Barry.

## PIC CHOOSES UNIPOL FOR PP JV WITH UCC

A joint announcement by Petrochemicals Industries Co. (PIC) of Kuwait and Union Carbide Chemicals & Plastics has confirmed the signing of a licence agreement for a new Unipol polypropylene plant at the Shuaiba complex in Kuwait.

Construction of the 80,000 ton/year facility is scheduled for completion in 1992. The plant will be capable of producing the full range of PP products and will be based on locally-produced propylene.

The project forms part of a larger scheme which also includes an FCC cracker.



## DONG SUNG CHEMICAL PICKS ALMA TECHNOLOGY

Lummus Crest, the engineering and construction subsidiary of US-based Combustion Engineering, has confirmed that Dong Sung Chemical Industries of Pusan, Korea, has selected the Alusuisse Italia/Lummus Crest maleic anhydride (Alma) process for a 25,000 ton/year facility.

Lummus has licensed the process to Dong Sung and is providing basic engineering services under contract.

The \$30m molten maleic anhydride plant will be located in Ulsan with startup planned for mid-1991. The feedstock will be n-butane derived from mixed butanes.

In what Lummus describes as "an industry first," the maleic anhydride produced will be used as a feedstock for butanediol which will be produced using a separate process.

Lummus says this award, the first for Korea and the fifth for the Alma process, brings the total designed capacity using the technology to 114.5m ton/year. Other plants are located in Japan, Taiwan and Italy. However, Alusuisse Italia and Dutch-based DSM have recently signed a letter of intent for a maleic anhydride joint venture.

Contracts for the Alma process have been awarded by Taiwan Synthetics, Shin Daikyowa Petrochemical and Nan Ya Plastics, however, plans by Compañia Española de Petroleos to use the process did not materialize as the Spanish company opted for BP technology.

The Alma process is the only commercially available maleic an-

hydride technology to combine fluid bed reaction and nonaqueous product recovery.

The process is claimed to be the most widely used of the newer processes to manufacture maleic anhydride and is said to offer significant capital cost savings over other available processes.

## CARBIDE CONFIRMS RIO UNIPOL UNIT

Union Carbide's Brazilian subsidiary has confirmed plans to set up a 200,000 ton/year Unipol reactor in a joint venture at the Itaguai complex in Rio de Janeiro state.

The project represents an investment of around \$80m. The project has to be submitted to the Brazilian industrial development secretariat and will involve Union Carbide's first Association with a Brazilian partner, in this case, Petroquisa.

As reported in the Brazilian congress has approved the participation of Petroquisa in upstream and downstream projects at the Itaguai complex as necessary to attract bids from private investors. In addition the state governor and the minister of development have signed the final draft for the directives covering the establishment of the complex.

UCC has also begun the disassembly of its silicone production facility located in Cotia, Sao Paulo state, for its relocation at Itatiba, also in Sao Paulo state. The rebuilt facility, with a capacity of 3,000 ton/year, will cost \$4m, with completion scheduled for 1990.

Carbide currently claims to hold around 35 per cent of the Brazilian silicones market. The

company had earnings of \$20m in 1988 from this business. Although exports are only just beginning, the company expects that they will increase once the move is completed.

## CIBA-GEIGY UK DETAILS EXPANSIONS

Ciba-Geigy UK has unveiled details of its investment plans. The UK subsidiary of the Swiss chemicals major intends spending about £72m (\$116m) on capital investment this year, bringing the four year total for 1986-89 to £224m.

The group is spending more than £20m on refurbishing its pharmaceuticals production facilities at Horsham. The units are expected to be ready by the second half of 1990. Part of this compensates for the move of drug making activities from Macclesfield.

The biggest investments involve Clifton Aniline and Ciba-Geigy's Paisley, Scotland-based pigments business. More than £30m is being invested at Clayton Aniline's works in Manchester, to expand dyestuffs and intermediate capacity. Bilateral Process Plant has picked up two contracts worth £4m to design and build two key storage facilities.

A similar amount has been spent on the Paisley unit, which will make phthalocyanin and other pigments and is due on-stream in September.

Ciba-Geigy is also spending between £20-30m modernizing its composites facility at Duxford and is pushing ahead with a £8m intermediates expansion at Grimsby. Although not part of the Ciba-Geigy UK group, a further £10m is being invested at Macclesfield to build production facilities for the Swiss major's optical products group, Ciba Vision.



## EXXON IN MASSIVE PUSH IN SOUTH EAST ASIA

Exxon Chemical plans a massive push into South East Asia, writes Natasha Alperowicz. In Malaysia it is proposing a \$700-800m petrochemical complex and in Thailand it has been accepted as partner in a \$250m aromatics joint venture. Also, in Singapore, Exxon is in very early stages of discussions concerning an aromatics complex.

A proposal submitted by Exxon to Petronas, Malaysia's state-owned oil company, calls for the construction of a 450,000 ton/year ethane cracker and a 450,000 ton/year polyethylene facility at Kerteh on Terengganu's north east coast. The plan is for a 50:50 joint venture with Petronas, which would supply gas from its offshore facility. Start up is scheduled for the end of 1993 or beginning of 1994.

The PE facility would be dedicated to the production of linear low density material with possibly some high density polyethylene also included. Much of the output from the plant would be destined for the export markets to the Asia-Pacific region.

The companies are currently studying which of the processes would be used in the downstream facility. Should the team decide to invest in an HDPE unit, the Union Carbide Corp Unipol process would probably be used. Exxon has a worldwide Unipol PE licence and has used the process successfully in several plants. Recently it has also taken the Mitsui Hi-Zex technology for HDPE and could also use it in the Malaysian plant.

In Thailand, Exxon has been invited to participate in a new,

partly export-oriented, aromatics joint venture. The US company has been offered a 35 per cent share with the state-owned Thai Oil Co having 40 per cent and Petroleum Authority of Thailand, the remaining 25 per cent.

Total investment cost will depend on the final configuration of the complex but it is expected to be a minimum of \$250m. The idea is to cover domestic demand and leave about 200,000 ton/year of paraxylene and 100,000 ton/year of benzene for export.

To be located at Sri Racha, close to Esso Standard's refinery, which would supply the reformat and pygas feeds, the complex is expected to produce 300-350,000 ton/year of paraxylene, 150,200,000 ton/year of benzene, 50,000 ton/year of toluene, 30,000 ton/year of orthoxylene and 20,000 ton/year of xylenes. The target date for start up is the last quarter of 1992. Technologies have not yet been selected. Although conceptually regarded as part of Thailand's NPC-2 complex, physically it would be separated by some 60 km distance.

Last year Exxon submitted a proposal to the Thai board of investment to build a \$40m normal paraffins plant for domestic and export markets near the Sri Racha refinery. The proposed plant would have a capacity in excess of 80,000 ton/year and export volumes would be about twice the volume sold to the local market.

Meanwhile BP Chemicals is also pursuing petrochemical development in Malaysia. Together with other companies it has submitted a proposal for a petrochemical complex and is in discussions with the Malaysian authorities.

## LUMMUS WINS LAVERA FURNACES

Atochem and BP Chemicals are investing FF630m (\$94.2m) in their 50-50 owned Naphtachimie cracker at Lavera in France. Originally built by Linde in 1972, the facility currently has a capacity of 500,000 ton/year.

The latest project will add 170,000 ton/year of ethylene capacity in two stages. Initially 150,000 ton/year will be added. A further expansion by 20,000 ton/year will be achieved at a later date through debottlenecking. Two new Lummus furnaces of 85,000 ton/year capacity are being added.

Atochem is also raising the capacity of its Confreville cracker from 385,000 to 470,000 ton/year by mid-1990.

The extra ethylene and propylene capacity will be used in existing plants and by third party customers. The propylene is used by Oxo Chimie and Appryl, respectively oxo alcohol and polypropylene joint ventures of BP and Atochem, and by Arco's propylene oxide plant nearby.

## UAE FERTILIZER JV FORMED BY KEMIRA

Kemira, Finland's state-owned fertilizers and chemicals group, has formed a joint venture with Union Agricultural Co., a leading agricultural concern in the United Arab Emirates, to set up a fertilizer plant in the Jebel Ali free zone.

Union Kemira Co. will initially produce 6,000 ton/year of water soluble compound fertilizers to be sold on the local and neighbouring Arab markets. Raw materials will come from other Gulf states. Kemira's role at this stage is that of an investor. The Finnish producer currently sells 5,000 ton/year of fertilizers to the UAE.



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# NEWS FROM JAPAN

## SYNTHETIC DYE PROD. IN 1988 SETS RECORD

Production of synthetic dyes in 1988 continued to be brisk as in the previous year and registered 65,600 tons, hitting an all-time high.

Although the Japanese dye-processing industry was still forced to be sluggish, the prevalent orientation towards dark-coloured clothing raised demand for dyes.

In the first half exports were inactive, but in the latter half

they saw a recovery especially in Southeast Asia, the main outlet region for Japanese dyes. As a result, exports recorded 20,100 tons, hitting an all-time high.

However, growth is no longer seen in terms of volume, and value has not yet returned to the ¥100-billion level. Consequently, unqualified optimism is out of place.

## Production and Deliveries of Dyes in 1988

(in tons)

|                                | Inven-<br>tories<br>A | Produc-<br>tion<br>B | C                 | Sales             | Exports<br>D      | Domestic<br>sales<br>E (C-D) | Imports<br>F     | Total<br>supply<br>G (E+F) |
|--------------------------------|-----------------------|----------------------|-------------------|-------------------|-------------------|------------------------------|------------------|----------------------------|
| Total                          | 7,118<br>(98.9)       | 65,628<br>(104.1)    | 64,343<br>(104.1) | 99,561<br>(101.8) | 20,117<br>(100.2) | 44,286<br>(106.1)            | 18,206<br>(99.2) | 62,508<br>(104)            |
| Direct dye                     | 656<br>(89)           | 5,500<br>(107)       | 5,457<br>(105.3)  | 6,495<br>(99.2)   | 747<br>(119.7)    | 4,724<br>(103.6)             | 2,844<br>(109.2) | 7,568<br>(105.6)           |
| Acid dye                       | 319<br>(91.7)         | 2,548<br>(106.1)     | 2,511<br>(105.4)  | 7,602<br>(110.9)  | 626<br>(110.4)    | 1,885<br>(103.8)             | 3,071<br>(106.2) | 4,957<br>(105.3)           |
| Basic dye                      | 750<br>(81.5)         | 4,965<br>(99.3)      | 4,265<br>(94.1)   | 7,327<br>(92.4)   | 1,535<br>(97.1)   | 2,780<br>(94.1)              | 1,098<br>(107)   | 3,878<br>(97.5)            |
| Mordant & acid<br>mordant dye  | 476<br>(96.4)         | 2,237<br>(98.1)      | 2,228<br>(94.6)   | 4,298<br>(97.6)   | 243<br>(116.8)    | 1,987<br>(92.5)              | 791<br>(98.5)    | 2,782<br>(94.3)            |
| Sulfur & sulfur<br>vat dye     | 345<br>(106.2)        | 2,651<br>(110.8)     | 2,592<br>(113.5)  | 1,834<br>(123.3)  | 890<br>(125.9)    | 1,701<br>(107.9)             | 1,188<br>(76.8)  | 2,888<br>(92.4)            |
| Vat dye                        | 90<br>(76.3)          | 2,624<br>(110.5)     | 2,478<br>(104.6)  | 6,576<br>(116.3)  | 1,452<br>(115.3)  | 1,026<br>(92.4)              | 450<br>(93.2)    | 1,478<br>(92.8)            |
| Azoic dye                      | 432<br>(130.9)        | 2,142<br>(88.8)      | 2,397<br>(96.5)   | 4,036<br>(98.7)   | —<br>(—)          | 2,397<br>(168)               | —<br>(—)         | 2,397<br>(119.7)           |
| Disperse dye                   | 1,798<br>(96.5)       | 17,044<br>(110.9)    | 16,859<br>(111)   | 26,184<br>(102.9) | 8,590<br>(121.6)  | 8,262<br>(101.6)             | 1,862<br>(79.5)  | 10,137<br>(96.8)           |
| Fluorescent dye                | 901<br>(113)          | 9,000<br>(92.9)      | 9,100<br>(95.7)   | 6,176<br>(86.1)   | 812<br>(31.9)     | 8,288<br>(119.1)             | 2,299<br>(118.6) | 10,588<br>(119)            |
| Reactive dye                   | 839<br>(113.8)        | 11,266<br>(103.6)    | 11,247<br>(104.6) | 18,634<br>(100.8) | 3,086<br>(118.7)  | 8,162<br>(100.1)             | 3,876<br>(113.2) | 12,036<br>(104)            |
| Organic solvent<br>soluble dye | 218<br>(102.3)        | 3,672<br>(109.5)     | 3,593<br>(108.6)  | 5,327<br>(112.6)  | 1,763<br>(109)    | 1,829<br>(108.2)             | 587<br>(92.3)    | 2,415<br>(103.8)           |
| Others                         | 294<br>(93.6)         | 1,979<br>(112.9)     | 1,616<br>(109.7)  | 5,072<br>(102.1)  | 373<br>(146.9)    | 1,245<br>(102.1)             | 140<br>(159.1)   | 1,384<br>(105.9)           |

Notes: 1. Percentages against the previous year are parenthesized.

2. Figures in column under asterisk (\*) indicate value (unit: ¥1 million)

Source: Japan Dyestuff & Chemical Industry Association.



## MITI PROJECT AIMED AT APPLYING CHEMICAL ECOLOGY TO AGRICULTURE

MITI plans to develop new technology for applying chemical ecology to agriculture in accordance with a 10-year, ¥20-billion project scheduled to be inaugurated next fiscal year.

It is intended that the targeted technology will utilize sex pheromone and other ecologically active substances in agriculture, forestry and fisheries, thereby reducing consumption of conventional-type pesticides and protecting useful life.

MITI envisages promoting the project on the basis of international co-operation since the said technology is likely to contribute to elimination of CO<sub>2</sub> and to environmental protection, both of which are being keenly discussed throughout the world.

In the insect, animal and plant worlds, communications are frequently carried on by means of chemical substances including sex pheromone. The MITI project is aimed at harnessing them for the above-mentioned purposes.

MITI intends to elucidate chemical communications between living things, examine substances involved with chemical communications and carry out research on organs for excreting and receiving chemical information.

Chemical ecology will be applied to agriculture, forestry and fisheries in various manners: sex pheromone serves to lure and kill insects and disturb their mating; it is possible to mask a substance — which works as a marker for parasites — in a bid to pre-

vent damage caused by harmful insects, false chemical information is employed for disturbing the ecology of harmful life, etc.

MITI has worked out the chemical-ecology project in response to the fact that The Association for the Progress of New Chemistry recently compiled an interim report on chemical communications between living things. The report claims it is necessary to employ substances involved with chemical communications instead of the agrochemicals now in use so that those involved can ease people's concern about the safety of pesticides and environmental pollution. In addition, it refers to the present situation and potentialities of applied research on chemical ecology.

## mitsui & co. to start compound production in holland

According to a source concerned, Mitsui & Co. recently founded in the Netherlands a company to colour synthetic resins and produce compounds jointly with Dainichiseika Colour & Chemicals Mfg. Co. The new company is named Plalloy MTD BV and capitalized at ¥325 million. Of the capital, 75% was furnished by Mitsui & Co. Germany, and Bussan International, and the remainder by Dainichiseika. The post of president has been taken by Takao Komatsuzaki, acting director of Synthetic Resin Department of Mitsui & Co., Germany. Orders have already been placed for the plants and equipment to be used in the 1st-stage construction project. The plant, which has a monthly production capacity of 400 tons, will be completed in December at the earliest and go

into full-scale operation next spring. Mitsui & Co. intends to use the new company as a base for the sale of synthetic-resin compounds so as to cope with the integration of the EC. For the time being, it will endeavour to help the advance of Japanese capital-affiliated enterprises in such fields as automobiles, office automation (OA) and household electrical appliances. In future it will stage wide-ranging business activities to secure customers in the EC.

With the EC's integration scheduled for 1992, major Japanese manufacturers of automobiles and household electrical appliances are advancing, or planning to advance, into Europe. Also, these companies, which are engaged in the processing of parts, have hastily begun to build production bases in Europe. As part of such a series of moves for the establishment of European bases, Mitsui & Co. and Dainichiseika have begun to establish their own bases for colouring of various synthetic resins and production of compounds.

The site selected is Kerkrade in the Limburg province of the Netherlands, which is eager to invite enterprises and has an investment incentive system. This place — 100 kilometers from Düsseldorf — is most suitable for operations covering the whole of Europe. It is said that the total investment amount, including that for construction of plants and equipment and buildings, is about ¥1 billion. The necessary raw materials will be procured in local markets, and sales will be made mainly to Japanese capital-affiliated enterprises in the EC.



## TSUBISHI KASEI PLANS \$50-BILLION INVESTMENT

Mitsubishi Kasei Corp. is scheduled to invest a total of ¥50,000 million in production facilities in the current fiscal year ending next March. The company plans to build mass-production facilities for magnetooptical disks, scale up sputtering/plating equipment for hard-disk production and build up manufacturing plants for 1,4-butanediol, higher alcohol, alpha-olefin, vinyl-chloride monomer (from 250,000 to 30,000 t/y) and engineering plastics.

The firm is endeavouring to step up business operations covering information/electronics-related materials and engineering plastics in line with its middle- and long-term business plans. Along with this, it is aiming at beefing up basic-chemicals operations since petrochemical business has grown markedly over the past few years.

It invested a little over ¥50,000 million in plants and equipment last fiscal year. The huge funds were used for building up power-generation facilities for captive use and producing far bigger quantities of alpha-olefin, higher alcohol, ethylene, active carbon, PS plates, hard magnetic disks and optical disks.

## NIHON OXIRANE TO EXPAND SM/PO PLANT

In order to cope with increased demand for styrene monomer (SM) and propylene oxide (PO), Nihon Oxirane Co. is planning to remodel and expand its plant for SM/PO based on the Halcon process during regular plant repairs scheduled for this autumn. The company's combined production capacities for SM and PO will be

increased to 288, and 130,000 t/y, respectively. It is said that the production capacity of the existing plant will reach maximum when this plant expansion by means of debottlenecking is realized. Since the company sees that SM/PO demand will continue to grow for the time being, it has started to consider construction of another plant. The new plant's production capacities for SM and PO have not been fixed as yet, but will probably be 240, and more than 100,000 t/y, respectively, considering the company's economic sale.

Nihon Oxirane is a joint company of Sumitomo Chemical Co., Showa Denko K.K., and ARCO Chemical Co., USA. The company continues to operate its plant using the Halcon process — by which both SM and PO can be produced — on the site of Sumitomo Chemical's Chiba factory. Its initial production capacity for SM and PO stood at 225, and 90,000 t/y, respectively, and were boosted from time to time to meet brisk demand for SM/PO. The current production capacities for them are 270, and 123,000 t/y, respectively. The existing plant is now in full operation but is not capable of completely satisfying the favourable demand

concerned. This is why the company has decided to enlarge its plant by means of debottlenecking during periodic plant repairs scheduled for this autumn. Related investment funds are estimated at some hundred million yen.

## TITANIUM DIOXIDE DEMAND PUT AT 278,000 TONS

Demand for titanium dioxide in FY89 continues to be favourable reflecting brisk demand in related industries such as paints and paper manufacture. It is estimated that the demand figure will reach 278,360 tons to exceed the record marked in the previous year.

Demand in FY88 hit an all-time high of 265,700 tons, up 8.9% over the previous year, supported by buoyant domestic demand from paints, rubber, plastics and paper manufacture.

This year domestic sales are expected to be 213,320 tons, up 5% over the previous year; and exports, 65,040 tons, up 4%, according to Japan Titanium Dioxide Industry Association.

All manufacturers without exception are running their plants flat out, in order to meet the steady demand that has lasted for the last several years.

Estimated Demand for Titanium Dioxide in FY89  
(in tons)

|                | FY87<br>(result) | FY88<br>(result) | FY89    | FY89/<br>FY88<br>(%) |
|----------------|------------------|------------------|---------|----------------------|
| Domestic sales | 179,862          | 203,160          | 213,320 | 105.0                |
| Exports        | 64,149           | 62,540           | 65,040  | 104.0                |
| Total          | 224,011          | 265,700          | 278,360 | 104.8                |



## ASAHI GLASS TO START URETHANE ENTERPRISE IN U.S.

Asahi Glass Co. will strengthen connections with Olin Corp. of the U.S., to supply urethane materials to Japanese manufacturers of automobiles and automobile parts who have advanced into the States. The two companies have founded Asahi-Olin Ltd. in Japan, to start an urethane enterprise. For the time being technological know-how accumulated by Asahi-Olin will be granted to Olin for supply to users connected with Japanese capital-affiliated automobile enterprises. It is expected that the two firms will found "Asahi-Olin America" (tentative name) and start an urethane enterprise on a full scale, once the marketing of products is put on the right track.

Asahi Glass founded "Asahi-Olin" jointly with Olin Corp. of the U.S. in 1974, to supply poly-

ol, TDI and other urethane materials to users in Japan. However, there is also growing demand for supply in the U.S. of materials with similar specifications, along with the increase in the number of cases of advancement into the States of Japanese manufacturers of automobiles and automobile parts.

It is to answer this demand that the technological know-how accumulated by Asahi-Olin will be granted to Olin. Polyol and system-liquid will be produced at Olin's Doran Plant at Brandenburg, Kentucky, and its plant at Lake Charles, Louisiana, for supply to users connected with Japanese capital-affiliated automobile enterprises.

More concretely, products with specifications similar to those of the products Asahi-Olin is currently turning out and supplying, will be produced and supplied by Olin of the U.S. under the guidance of

Asahi-Olin. Also, the specifications of the products and technology that Asahi-Olin has developed in Japan will be followed totally by Olin in the U.S., to meet the demand of customers.

## TAKEDA CHEMICAL INDUSTRIES BUILDS VITAMIN C PLANT IN U.S.

Takeda Chemical Industries announced that it had completed the construction of its vitamin-C plant in the suburbs of Wilmington, North Carolina, the U.S. This plant was built by Takeda Chemical Products USA, Inc. (TCP) — American subsidiary of Takeda Chemical Industries. It has an annual production capacity of 5,000 tons. Production will be started in October, and the plant is scheduled to go into full-scale operation next year. Its products will be sold in the North American market via TCP. Completion of the new plant enables Takeda Chemical Industries, with its Himeji plant, to establish a dual production structure covering Japan and the States. It will renew its vitamin-C sales offensive in Europe, the U.S., and Southeast Asia.

TCP, which is to take charge of the production at the new plant, was founded in December 1985 solely with investment by Takeda Chemical Industries. First of all, it started vitamin-B production (100 t/y) in January 1986, then hastily began to build the above-mentioned vitamin-C plant in June of the year before last at a cost of about \$90 million.

Demand for vitamin C in the world as a whole is estimated at about 33,000 tons a year. It has been increasing year by year. The biggest supplier is Hoffman-La Roche of Switzerland which has an annual production capacity of 36,000 tons, followed by Takeda Chemical Industries.

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## New Developments from Japan

### OPTICAL CONTROL OF LIQUID-CRYSTAL ORIENTATION POSSIBLE

A research group at Research Institute for Polymers and Textiles has succeeded in controlling the orientation of nematic-phase liquid crystal in a reversible manner by radiating ultraviolet and visible rays onto the liquid crystal involved.

They produced a 1-layer azobenzene-based Langmuir-Blodgett membrane in an air/water interface through esterification reaction between carboxylic acid and polyvinyl alcohol incorporating azobenzene (AZ) in the form of side chains. This sandwiched the membrane and nematic-phase liquid crystal between two pieces of glass substrate and applied ultraviolet and visible rays thereon by turns. As a result, they confirmed the successful control of orientation of nematic-phase liquid crystal by observing changes in transmittance of the said rays with a polarizing plate.

They also found that the liquid crystal orientation can be changed when the density of the azobenzene components is set at more than 1-nanosquare meter.

The orientation-controlling technology will facilitate production of analogue-style liquid-crystal displays and photochromic-type optical recording media designed to enable nondestructive read-out.

In conventional methods, the liquid-crystal orientation is controlled by applying an electric field to the liquid crystal concerned. They, therefore, call for setting of electrodes and wiring, both of which provide numerical displays having characteristic shapes. The new technology comple-

tely eliminates employment of electrodes.

### NIPPON CARBON DEVELOPS SILICON CARBIDE FRG

Nippon Carbon Co., Ltd. has recently begun cultivating the structural materials and electronics materials markets for its newly developed fiber-reinforced ceramic (FRC) material employing the company's "Nicalon" silicon carbide (SiC) fibers. The new material consists of SiC fibres that have been fashioned into cloth or sheets and impregnated with polycarbosilan (PCS), silicon carbide's constituent material. The initial formation is then fired into an SiC-SiC composite.

This process preserves silicon carbide's properties of high strength, thermal and shock resistance, and tenacity, and enables flexible formation of size and shape. The company is already shipping test product samples from its Yokohama plant R&D center and is hopeful of using the product as a promising new material in the aerospace field, where exceptional resistance to heat is required.

Nippon Carbon has positioned its silicon carbide fibers into a strategic product line and is actively devising ways to upgrade and reform these materials. At the same time, the company is making advances in fields using these fibers, including fiber-reinforced plastics (FRP), fiber-reinforced metals (FRM), and fiber-reinforced ceramics (FRC), areas in which Nippon Carbon has established a firm reputation.

The newly developed FRC is one link in management's overall strategy of bolstering its silicon carbide fibers and composite materials business.

After determining the desired

cloth or sheet pattern, carbon fibers are impregnated with PCS and pressed into shape and fired at 800 ~ 1,000°C. The resulting material is resistant to heat of 1,000°C and has a bending strength of 110 MPa sustainable at temperatures up to 1,000°C.

Nippon Carbon is targeting its R&D efforts on structural materials, particularly for the aerospace industry, where the characteristics of high strength and tenacity under extreme temperatures are required. In line with user requests, the company has also begun shipping sample products to the thermal power generation industry for potential applications as high-temperature materials.

### TONEN, NORITAKE DEVELOP CFRC OF EXTRAORDINARY FLEXURAL STRENGTH

Toa Nenryo Kogyo K.K. (Tonen) and Noritake Co., Ltd. have announced that they have succeeded in jointly developing CFRC (carbon fiber-reinforced ceramics) composite material excelling in heat resistance and mechanical characteristics. This composite material is produced by mixing the pitch-source carbon fiber developed by Tonen with matrix, that is, a mixture of polysilazane with silicon nitride or mullite. Its bending strength is far greater than that of conventional ceramic composite materials. Moreover, the polysilazane used in the matrix does not contain carbon or oxygen so it excels in oxidation resistance and can be molded at a relatively low temperature. The two companies are planning to use this composite material in developing the use of ceramic materials for gas-turbine automobiles.

Tonen and Noritake have been endeavoring to develop CFRC excelling in bending strength and



mechanical characteristics, with Noritake in charge of the task of continuation on the basis of the carbon fiber and polysilazane developed by Tonen. The CFRC developed by the two companies have a bending strength of 980 or 850 megapascals compared with 600 to 700 or 400 to 500 megapascals, respectively, in the case of conventional ceramics made mainly of silicon nitride or mullite.

### CLINICAL TESTING WILL START ON STEM CELL GROWTH STIMULATOR

Otsuka Pharmaceutical Co. will begin clinical testing on the actions of interleukin-1 beta (IL-1 beta) with regard to growth of stem cells. IL-1 beta has been produced by Otsuka as an anti-malignant-tumor agent by means of DNA recombination. The sub-

stance is known to help stimulate growth of stem cells.

A stem cell is an unspecialized cell that gives rise to differentiated cells, e.g., red blood corpuscles, leukocytes, macrophages, blood platelets and lymphocytes (B-cells, T-cells). R&D has been under way on various inter-leukins acting to stimulate the differentiation of stem cells but these stimulators work properly only when the stem cells concerned are in a normal condition. Problems arise when the stem cells themselves are damaged by chemotherapy and radiotherapy or when their self renewal is insufficient.

The researchers involved now consider it important to use an agent stimulating the growth of the stem cells in combination with the said differentiation stimulators. A blood platelet-source

substance has recently proved stimulate growth of stem cells and it has also been confirmed that IL-1 beta has such an action.

Syntex Inc. of the U.S. succeeded in cloning interleukin-1 alpha and -1 beta in 1985. Otsuka was successful in cloning IL-1 beta the following year. The Japanese firm has been carrying out R&D on both the blood platelet-source stimulator and IL-1 beta. The company is also considering conducting clinical tests on IL-1 beta in the U.S.

### CLINICAL TESTS ON CRUDE DRUG INGREDIENTS UNDERWAY: TSUMURA

Tsumura & Co. is pushing forward with new-drug development using effective ingredients of Chinese crude drugs.

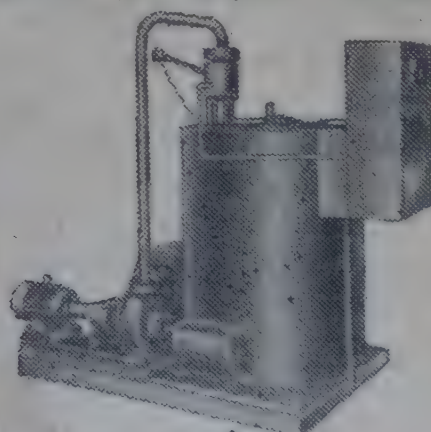
The company is carrying phase-II clinical tests on gomisin A (development code: TJN 1) as an agent for treatment of various diseases. Gomisin A is a component of lignan contained in Gomisin, a Chinese crude drug. Clinical testing will also be conducted on a combination of Sho-saikin and Keishi-ka-shakuyaku-to as an anti-epilepsy agent as well as capillarisin — an ingredient of the Chinese crude drug Inchu — as an anticancer agent.

Since Chinese crude drugs were listed on the Japanese government's drug tariff, no crude drug-based medicine has been entered on the list.

Tsumura has been pushing crude drug research and development and is also strengthening efforts to synthesize new drugs. As regards capillarisin mentioned above, the company has conducted joint research with researchers at Gifu College of Pharmacy and Kyushu University, resulting in the finding of its strong effect against cancer cells in vitro.

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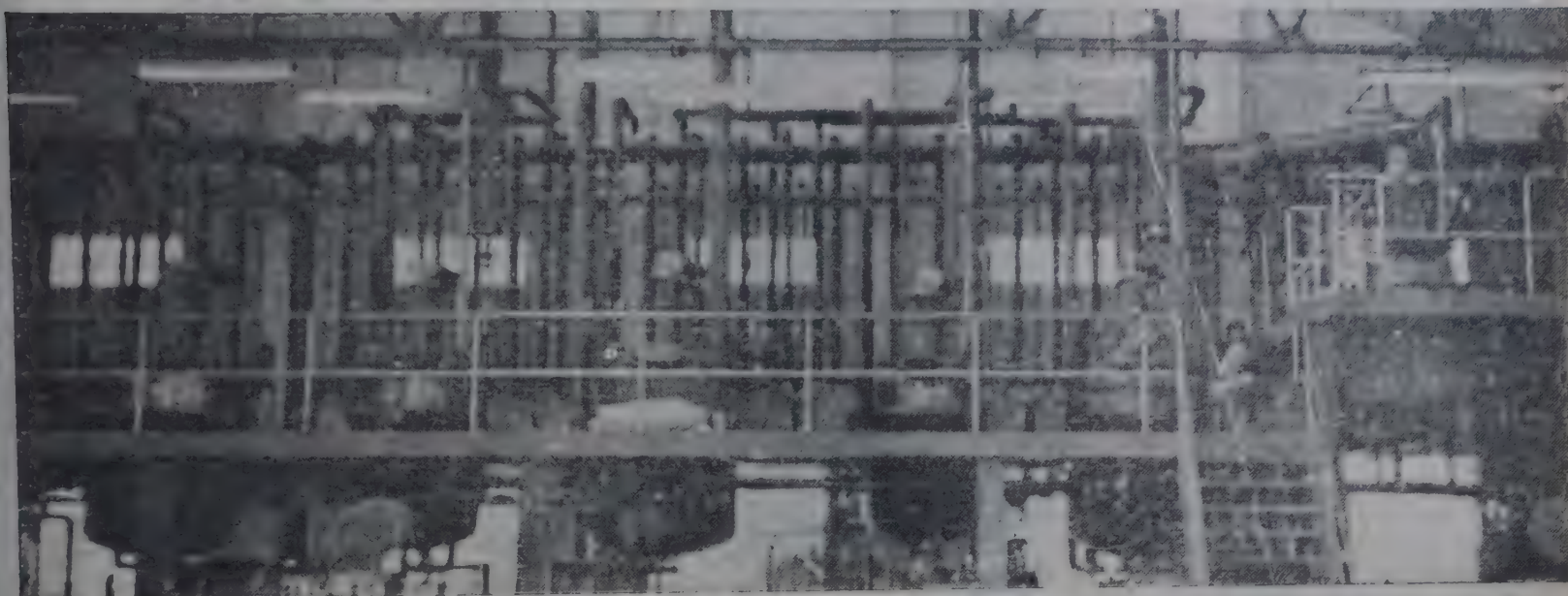
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# MARKET INFORMATION

## Intermediate Prices Up

Prices of dye intermediates particularly of those manufactured by OC and Atul firmed up in the Bombay chemicals market. Prices of

rangolite (Czech. variety) further increased to Rs. 68 per kg. Cyclohexanone firmed up to Rs. 56 in the wake of sustained seasonal demand.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent – and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on August 22, 1989)

| INDUSTRIAL CHEMICALS      |        | Per Kg.                          |        |                                |        |
|---------------------------|--------|----------------------------------|--------|--------------------------------|--------|
| Ammonium sulphate         | 2.50   | Borax (Granular)                 | 15.00  | Cobalt oxide                   | 280.00 |
| Ammonium phosphate (Mono) | 14.50  | Borax (Powder)                   | 15.25  | Cresylic acid                  | 52.00  |
| Ammonium phosphate (Di)   | 14.00  | Boric acid (Tech)                | 28.00  | Camphor (Indian)               | 105.00 |
| Ammonium carbonate (Di)   | 17.00  | Bisphenol-A                      | 82.00  | Cream of Tartar (Tech.) China  | 70.00  |
| Ammonium bicarbonate      | 5.60   | Butyl carbitol                   | 110.00 | Citric acid (Belgium) (Resale) | 47.00  |
| Ammonium chloride         | 3.00   | Caustic soda (Flakes)            | 14.00  | Citric acid (Indian) (Resale)  | 47.00  |
| Ammonium nitrate          | 6.00   | Caustic soda (Solid)             | 12.00  | Copper sulphate                | 24.00  |
| Arsenic white powder      | 24.00  | Caustic soda (Lye)               | 10.00  | Chromic acid                   | 61.00  |
| Acrylamide (Resale)       | 100.00 | Calcium chloride 70% (Solid)     | 3.25   | Ethylene urea                  | 58.00  |
| Barium carbonate          | 6.00   | Calcium chloride 75-80%(fused)   | 3.50   | Ferric chloride (Lumps)        | 5.50   |
| Bleaching powder (33% Cl) | 4.20   | Calcium chloride 36% (Anhydrous) | 5.00   | Ferric chloride (Anhydrous)    | 16.00  |
|                           |        | Calcium carbonate (precipitated) | 4.25   | Glue flakes                    | 15.00  |
|                           |        | Calcium carbonate (Activated)    | 4.75   | Glue sheets                    | 6.75   |
|                           |        |                                  |        | Gohsenol GH-17                 | 115.00 |
|                           |        |                                  |        | Hydro                          | 38+ST  |

CHEMICALS

FERTILIZERS

SUGAR, CEMENT

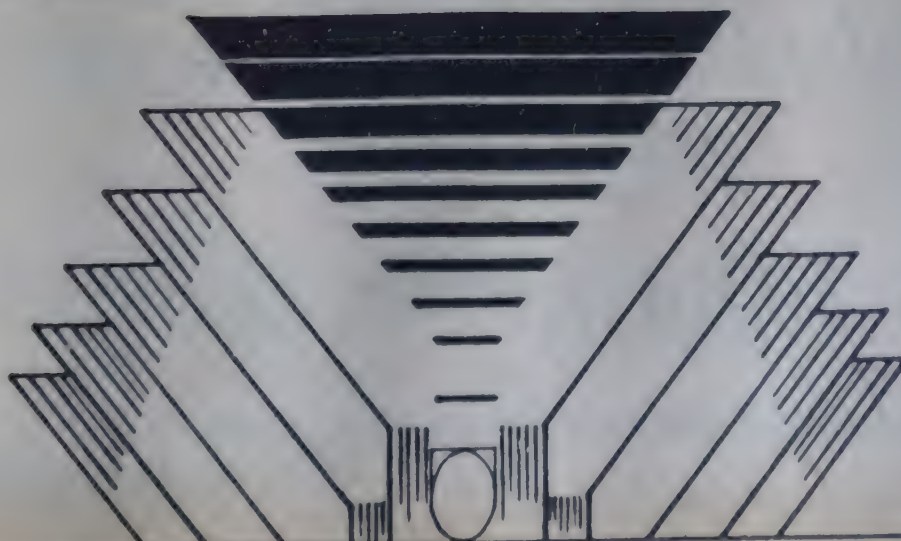
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| Hyflosupercell                  | 20.00     | Sodium sulphide 58-60% (Flakes) (TCL)          | 20.00          | Butanol                        | 34+ST |
| Hexamine (Resale)               | 35.00     | Sodium sulphide pure (Flakes)                  | 12.25          | Benzyl Alcohol                 | 60.00 |
| Industrial Wax                  | 25.00     | Sodium nitrite (Resale) per 50 kg.             | 680.00         | Benzyl Chloride                | 34.00 |
| Litharge                        | 40.00     | Sodium chlorite 80% (Spain)                    | 88.00          | Benzo trichloride              | 16.00 |
| Lead Acetate (Tech.)            | 31.25     | Soda Ash (Tata)                                | 5.00           | Benzoyl chloride               | 22.00 |
| Lithopone                       | 18.50+ST  | Soda Ash (Birla)                               | 4.50           | Bromine Liquid                 | 70.00 |
| Magnesium chloride (Crystal)    | 2.25+ST   | Soda Ash (Imp.)                                | 4.50           | Chloroform                     | 31.00 |
| Menthol crystal (Flakes)        | 900+Ex+ST | Sodium bicarbonate                             | 7.50           | Carbon Tetrachloride           | 19.50 |
| Menthol bold                    | 665+Ex+ST | Sodium bisulphite                              | 4.50           | Cellosolve                     | 67+ST |
| Menthol crystal cold            | 700+Ex+ST | Sodium silicate                                | 3.00           | Cyclohexanone                  | 54+ST |
| Magnesium carbonate (Japan)     | 16.00     | Sodium acetate                                 | 5.00           | Cyclohexanol                   | 58+ST |
| Magnesium carbonate (Indian)    | 18.00     | Sodium alginate                                | 250+ST         | Diacetone (Resale)             | 34.00 |
| Maleic Anhydride (Resale)       | 39.00     | Titanium Dioxide (Anatase)                     | 130+ST         | Diethyl Oxalate                | 34.00 |
| Mercury (34.5 Kgs)              | 12,000.00 | Titanium Dioxide (Rutile -- RCR <sub>2</sub> ) | 150.00         | Diethyl glycol (DEG)           | 43.00 |
| Nickel chloride                 | 110.00    | Tartaric acid                                  | 100.00         | Diethyl Phthalate              | 45.00 |
| Oxalic acid (Resale)            | 22.00     | Trisodium phosphate                            | 5.50           | Diallyl Phthalate              | 56.00 |
| Peppermint oil (Rectified)      | 195+Ex+ST | Thiourea                                       | 80.00          | Dimethyl Phthalate             | 28.00 |
| Potassium carbonate (Indian)    | 30.00     | Urea (Tech.)                                   | 2.90           | Diethyl Adipate                | 52.00 |
| Potassium carbonate (Imported)  | 32.00     | Vacuum salt                                    | 1.00           | Dibutyl Adipate                | 42.00 |
| Potassium bichromate            | 32.50+ST  | Zinc Dust                                      | 32.00          | Dipentene                      | 15.00 |
| Potassium phosphate (Mono)      | 14.00     | Zinc Oxide                                     | 52.00          | Dimethylamine 40%              | 26.00 |
| Potassium phosphate (Di)        | 14.00     | Zinc chloride powder (Tech.)                   | 12.50          | Dimethylamine 50%              | 30.00 |
| Polyvinyl alcohol (No. 117)     | 115.00    | Zinc sulphate                                  | 7.00           | Ethyl Acetate                  | 21.00 |
| Polyvinyl alcohol (No. 173)     | 120.00    |                                                |                | Ethyl Acrylate                 | 65.00 |
| Polyvinyl alcohol (No. 208)     | 150.00    |                                                |                | Ethylene Dichloride            | 14.50 |
| Paraformaldehyde (Resale)       | 23+ST     |                                                |                | Ethylene Glycol                | 48+ST |
| Phthalic anhydride 36% (Resale) | 25.50     | <b>SOLVENTS</b>                                | <b>Per Kg.</b> | Formic Acid (Imp.)             | 26.00 |
| Pentaerythritol (Resale)        | 45.00     | Acetic Acid Glacial (Resale)                   | 14.50          | Formaldehyde (Resale)          | 7.50  |
| Paraffin wax                    | 20+ST     | Acetic Anhydride (Resale)                      | 29.00          | Glycerine (CP)                 | 55.00 |
| Rangolite (German)              | 80+ST     | Acetone (Resale)                               | 23.00          | Glycerine (IW)                 | 53.00 |
| Rangolite (Czech.)              | 65+ST     | Adipic Acid                                    | 57.00          | Hydrogen Peroxide 50% (Resale) | 28.00 |
| Sodium sulphate (Fine)          | 6.00      | Aceto Acetanilide                              | 55.00          | Isopropyl Alcohol              | 40.00 |
| Sodium sulphate (Coarse)        | 5.00      | Aniline Oil                                    | 71.00          | Isobutyl Alcohol (Resale)      | 30.00 |
| Sodium sulphide 50-52% (Flakes) | 11+ST     | Benzoate Plasticiser                           | 62.00          | Monoethanolamine (Resale)      | 65.00 |
|                                 |           | Butyl acrylate                                 | 78+ST          | Melamine                       | 60.00 |
|                                 |           | Butyl stearate                                 | 50.00          | Methyl Ethyl Ketone            | 45.00 |
|                                 |           |                                                |                | Methyl Isobutyl Ketone         | 58.00 |
|                                 |           |                                                |                | Methyl Acrylate                | 60.00 |
|                                 |           |                                                |                | Methyl Dichloride (Resale)     | 26.00 |

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Iso Propyl Alcohol  
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Methyl Formate  
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Phones: 321020/339968/344937

Residence: 6124644/6122149



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| Meta Cresol                   | 60.00  |
| Nitrobenzene                  | 30.50  |
| Nitric Acid (Conc.) (RCF)     | 2.50   |
| Ortho Cresol                  | 30+ST  |
| Phenol (Resale)               | 37.00  |
| Propylene Glycol              | 55.00  |
| Polyethylene Glycol (No.200)  | 50.00  |
| Polyethylene Glycol (No.400)  | 57.00  |
| Polyethylene Glycol (No.500)  | 52.00  |
| Polyethylene Glycol (No.1600) | 54.00  |
| Polyethylene Glycol (No.4000) | 70.00  |
| Polyethylene Glycol (No.6000) | 85.00  |
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| Styrene Monomer               | 36.00  |
| Sorbitol                      | 14.00  |
| Sulphuric Acid                | 2.80   |
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| Turkey Red Oil (50%)          | 20.00  |
| Vinyl Acetate Monomer         | 47.50  |

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|-----------------------|-----------|
| Benzene               | 11.00     |
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| N-Hexane              | 12.00     |
| Methanol              | 13.00     |
| Solvent Naphtha Heavy | 10.50     |
| Solvent Naphtha Light | 8.50      |
| Toluene               | 21.00     |
| Xylene                | 22.00     |

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| Alpha Naphthol (Imp.)           | 190.00    |
| Aceto Acetic Ester (Methyl)     | 66.00     |
| Ammonium Molybdate              | 215.00    |
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| Anthranilic Acid                | 75.00     |
| 2-Amino 4-Nitrophenol           | 150.00    |
| Blue B. Base (Local)            | 255.00    |
| Beta Naphthol (Atul)            | 75.00     |
| Benzidine Dihydrochloride (BDH) | 98.00     |
| Bromamine Acid                  | 600.00    |
| BON Acid                        | 130-Ex+Ta |
| Chicago Acid IRS                | 330.00    |
| Coach Acid                      | 55.00     |
| C. Acid (Imp.)                  | 165.00    |
| Cyanuric Chloride               | 137.00    |
| 2,4- DNCB                       | 31.00     |
| Dihydrothio PTOS (Imp.)         | 1,000.00  |
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| disulphonic acid                | 160.00    |
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| Gamma Acid (Atul)               | 200.00    |
| H. Acid (Atul)                  | 110.00    |
| G. Salt                         | 75.00     |
| Isophthalic Acid                | 45.00     |
| J. Acid                         | 365.00    |
| J. Acid Urea                    | 400.00    |
| K. Acid                         | 127.00    |
| MPDS (German)                   | 190.00    |

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|--------------------------------|--------|
| MNA                            | 140.00 |
| Meta Ureido Aniline            | 235.00 |
| MPD (Local)                    | 215.00 |
| MPD (Japan)                    | 250.00 |
| Naphthenic Acid                | 40.00  |
| N-Methyl J. Acid               | 540.00 |
| N-Methyl Aniline               | 130.00 |
| Naphthalene (Refined)          | 21.00  |
| Ortho Anisidine (OA) (Imp.)    | 105.00 |
| Ortho Dichloro Benzene (ODCB)  | 16.00  |
| OT Base                        | 117.00 |
| Para Dichloro Benzene (PDCB)   | 27.00  |
| Para Anisidine (PA local)      | 150.00 |
| PNA                            | 100.00 |
| Para Cresidine (Imp.)          | 400.00 |
| Para Amino Azo Benzene (India) | 190.00 |
| PNCB                           | 53.00  |
| Para Amino Acetanilide         | 170.00 |
| 1-Phenyl 3-Methyl 5-Pyrazolone | 150.00 |
| Phenyl J. Acid                 | 375.00 |
| Para Amino Benzoic Acid        | 135.00 |
| PT Base                        | 158.00 |
| Rhoduline Acid                 | 530.00 |
| Resist Salt 80%                | 34.00  |
| Resorcinol                     | 190.00 |
| Sodium Naphthionate            | 67.00  |
| 5-Sulpho-Anthranilic Acid      | 82.00  |
| Sulphanilic Acid               | 52.00  |
| Sulpho Tobias Acid             | 165.00 |
| Trichloro Benzene (TCB)        | 22.00  |
| Tobias Acid                    | 165.00 |
| Metanilic Acid                 | 48.00  |
| MTD                            | 114.00 |

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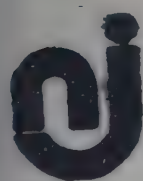
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# Bombay Dyes Market

(Prices as on August 22, 1989)

| ACID COLOURS                      |  | Per Kg. |                          |         |                   |         |
|-----------------------------------|--|---------|--------------------------|---------|-------------------|---------|
| Acid Violet 4BS                   |  | *190.00 | Brill. Fast Helio 2R     | 385.85  | Red 2B            | 422.    |
| Acid Maroon V                     |  | 110.00  | Brill. Fast Helio 2RS    | 177.30  | Red FB            | 425     |
| Acid Orange II                    |  | 112.55  | Brill. Fast Helio BS     | 116.10  | Red Violet FBL    | 622.    |
| Acid Orange ILY                   |  | 93.85   | Brill. Violet Extra      | 181.45  | Orange 3R         | 254.    |
| Acid Red A                        |  | 137.00  | Blue 2B                  | 102.50  | Violet 3R         | 370.    |
| Acid Scarlet 3R                   |  | 128.35  | Blue G                   | 220.45  | Violet RL         | 355.    |
| Acid Red 3BN                      |  | *195.00 | Sky Blue FB              | 242.00  | Violet 6R         | 638.    |
| Acid Red R2R                      |  | 132.00  | Copper Blue GR           | 190.25  | Scarlet RR        | 283.    |
| Acid Red RS                       |  | 88.00   | Fast Greenish Blue GL    | 114.60  | Rubine 3B         | 289.    |
| Acid Patent Blue AS               |  | *280.00 | Developed Black BT       | 149.95  | Rubine CB         | 449.    |
| Acid Green V                      |  | *375.00 | Blue NB-2B               | 348.45  | Blue GL           | 419.    |
| Acid Coomasi Blue                 |  | 200.00  | Blue NB-2BG              | 214.70  | Blue BGF          | 805.    |
| Acid Yellow 5GN                   |  | 65.00   | Developed Black NB-GHB   | 214.70  | Navy Blue RE      | 359.    |
| Acid Red PG                       |  | 85.00   | Green B                  | 142.75  | Brown 3REL        | 272.    |
| Acid Red GRS                      |  | 78.00   | Green NB-B               | 218.90  | Black GEL         | 420.    |
| Acid Black 10 BX                  |  | 157.15  | Green 2B-N               | 218.90  | Dark Brown 3B     | 411.    |
| Acid Black BX                     |  | 126.95  | Brown MR                 | 197.40  |                   |         |
| Acid Black Wax                    |  | 135.50  | Brown CN                 | 137.00  |                   |         |
| Crosein Scarlet MOO               |  | 200.30  | Golden Brown G           | 175.85  | BASE COLOURS      |         |
| Procinil Yellow GS (ICI, UK)      |  | 265.00  | Catechin G               | 155.70  |                   | Per Kg. |
| Procinil Red GS (ICI, UK)         |  | 530.00  | Omega Tan                | 161.45  | Fast Yellow GC    | 77      |
| Procinil Blue RS (ICI, UK)        |  | 315.00  | Catechin GS              | 102.80  | Fast Orange GC    | 128     |
| Procinil Scarlet G (ICI, UK)      |  | 600.00  | Black E Hly. Conc.       | 180.15  | Fast Scarlet R    | 198     |
| Procinil Orange G (ICI, UK)       |  | 250.00  | Black E Extra Hly. Conc. | 180.15  | Fast Scarlet RC   | 128     |
| Procinil Rubine (ICI, UK)         |  | 550.00  | Black NB-ER Hly. Conc.   | 290.50  | Fast Scarlet RCR  | 105     |
| * To get resale price add 6% tax. |  |         | DISPERSOL COLOURS        |         |                   |         |
| DIRECT COLOURS                    |  | Per Kg. |                          | Per Kg. | Fast Scarlet G    | 115     |
| Yellow 3GX                        |  | 114.00  | Red B 3B Conc            | 611.50  | Fast Scarlet GN   | 92      |
| Gun Yellow RCH                    |  | 175.85  | Red B 2B Conc            | 797.90  | Fast Scarlet GG   | 77      |
| Fast Yellow GCH                   |  | 171.50  | Red CB Powder            | 1048.25 | Fast Scarlet GGS  | 73      |
| Yellow CFG Hly. Conc.             |  | 721.00  | Red D2B Powder           | 589.85  | Fast Red B        | 233     |
| Fast Yellow GS                    |  | 126.96  | Violet C 4R Conc.        | 1202.70 | Fast Red RC       | 115     |
| Fast Yellow CHRS                  |  | 116.85  | Blue BG Conc             | 580.65  | Fast Red R Flakes | 158     |
| Viscose Orange A                  |  | 210.35  | Blue BN Powder           | 128.20  | Fast Red TR       | 181     |
| Fast Orange GR                    |  | 171.50  | Blue D 2R Powder         | 588.25  | Fast Red TR Oil   | 223     |
| Red                               |  | 122.65  | Navy BT Conc             | 531.95  | Fast Red RL       | 251     |
| Dark Tan                          |  | 98.15   | Blue B 2G Conc           | 577.95  | Fast Red KB Oil   | 251     |
| Red IIR                           |  | 98.15   | Black BT Conc            | 319.50  | Fast Bordeaux GP  | 236     |
| Red 4B                            |  | 217.55  | Blue BR                  | 482.40  | Fast Garnet GBC   | 103     |
| Bordeaux BW                       |  | 170.10  | Yellow 7GL               | 813.20  | Fast Violet B     | 548     |
| Fast Scarlet 4BS                  |  | 223.50  | Yellow 5RX               | 269.90  | Fast Blue BB      | 566     |
| Red 12B                           |  | 220.45  | Yellow 3G                | 473.20  |                   |         |
| Bordeaux Hly. Conc.               |  | 249.20  | Yellow                   | 140.00  | NAPHTHOL COLOURS  |         |
| Cotton Red N                      |  | 117.05  | Yellow AL                | 167.20  |                   | Per Kg. |
| Brill. Fast Helio B               |  | 362.85  | Yellow Brown REL         | 311.70  | ASG               | 301     |
|                                   |  |         | Yellow FFL               | 571.40  | AS                | 205     |
|                                   |  |         | Gold Yellow GG           | 320.80  | ASSW              | 379     |
|                                   |  |         | Pink REL                 | 593.00  | ASBS              | 253     |
|                                   |  |         | Red BEL                  | 615.60  | ASBO              | 266     |
|                                   |  |         |                          |         | ASD               | 209     |
|                                   |  |         |                          |         | ASOL              | 243     |



|                        |                |                              |                |                                |         |
|------------------------|----------------|------------------------------|----------------|--------------------------------|---------|
|                        | 369.00         | Blue H-FRD                   | 305.80         | Brill. Purple 2R Hly Conc.     | 744.25  |
|                        | 336.05         | Navy Blue H3R                | 333.75         | Brill. Purple 4R Supra Disp.   | 604.25  |
|                        | 236.00         | Blue H 5RX                   | 286.20         | Brill. Purple 2R Acra Conc.    | 779.85  |
|                        | 249.95         | Navy Blue M3R                | 355.70         | Blue 2R Powder Fine            | 675.30  |
|                        | 2002.35        | Brill. Blue MR               | 405.60         | Blue BC Acra Con Pdr. Fine     | 1013.15 |
|                        | 2459.45        | Brill. Blue M RX             | 214.20         | Blue BC Conc. Pdr. Fine        | 713.65  |
|                        | 143.00         | Brill. Blue M-G              | 226.45         | Blue R Conc. Pdr. Fine         | 719.70  |
|                        | 538.65         | Blue M 4GD                   | 369.40         | Blue Conc. Powder              | 645.80  |
|                        | 652.60         | Navy Blue M RB               | 341.85         | Brill. Blue 2R Hly. Conc.      | 378.55  |
|                        |                | Turquoise M-G                | 240.30         | Blue RR Supra Powder           | 629.35  |
|                        |                | Brill. Blue M GX             | 516.25         | Brill. Blue 2R Supra Disp.     | 115.65  |
| <b>COLOURS</b>         | <b>Per Kg.</b> | Blue 3R Acra Powder          | 718.20         | Dark Blue 2R Powder Fine       | 512.65  |
|                        |                | Dark Brown H 6R              | 248.45         | Blue BC Supra Disp.            | 419.65  |
| Golden Yellow HR       | 207.95         | Cobalt Oxide                 | 285.00         | Jade Green XBN Powder Fine     | 555.80  |
| Yellow H4G             | 145.65         | Green H4BD                   | 287.00         | Jade Green XBN Acra            |         |
| Extra Yellow H-8GP     | 168.55         | Green H-E4BI                 | 169.80         | Conc. Pdr                      | 1026.05 |
| Yellow HE6G            | 214.75         | Red Brown H IF               | 143.25         | Jade Green 2G Pdr. Fine        | 533.25  |
| Yellow G-E4R           | 276.05         | Orange Brown H 28            | 209.05         | Jade Green 2G Ptg. Paste       | 125.40  |
| Yellow H7G             | 332.30         | Brown M GRN                  | 188.80         | Jade Green XBN Ptg. Paste      | 126.00  |
| Yellow M4R             | 275.45         | Black H-N                    | 314.20         | Jade Green 2G Supra Disp.      | 618.00  |
| Yellow MGR             | 387.65         |                              |                | Olive D Pdr. Fine              | 563.90  |
| Yellow M4G             | 201.15         |                              |                | Olive Green B Supra Disp.      | 421.70  |
| Yellow M8G             | 366.10         | <b>SULPHUR COLOURS</b>       | <b>Per Kg.</b> | Jade Green XBN Supra Disp. (N) | 327.30  |
| Yellow M3R             | 244.70         |                              |                | Olive OMW Powder Fine          | 698.55  |
| Orange H2R             | 303.80         | Navy Blue                    | 210.35         | Olive OMW Supra Disp.          | 538.05  |
| Red H7B                | 157.95         | Green G                      | 194.55         | Olive D Supra Disp.            | 361.70  |
| Orange M2R             | 313.15         | Black Grains Extra           | 72.25          | Olive R Supra Disp.            | 470.25  |
| Red H8B                | 213.55         | Black Grains OG              | 73.70          | Olive D. Ptg. Paste            | 193.00  |
| Scarlet H RN           | 245.05         | Black GXE Conc.              | 70.85          | Olive Green B Ptg. Paste       | 199.10  |
| Supra Red H-3BP        | 179.80         | Black GXE                    | 57.90          | Olive Green B Acra Conc.       | 741.10  |
| Red H-F3B              | 243.45         | Black GXR                    | 69.40          | Olive R Acra Conc.             | 779.85  |
| Magenta HB             | 182.00         | Black Grains 800             | 62.80          | Brown R Pdr. Fine              | 869.45  |
| Red M 5B               | 160.05         | Black EXR Grains             | 73.70          | Dark Brown 3R Fine             | 826.25  |
| Red M 8B               | 218.35         | Black EXR Grains 800         | 59.35          | Brown G Supra Disp.            | 582.05  |
| Pink MB                | 137.10         |                              |                | Brown 2G Supra Disp.           | 716.10  |
| Magenta MB             | 163.65         |                              |                | Brown R Supra Disp.            | 547.35  |
| Purple H-3R            | 219.55         | <b>VAT COLOURS (ICI)</b>     | <b>Per Kg.</b> | Brown BR Powder                | 867.75  |
| Purple H-7R            | 175.40         |                              |                | Dark Brown 3R Ptg. Paste       | 217.15  |
| Navy Blue H 3R         | 333.75         | Yellow 5G Supra Disperse     | 561.85         | Dark Brown 3R Supra Disp       | 529.00  |
| Blue H-GR              | 406.40         | Yellow 5G Acra Conc          | 818.60         | Brown G Acra Conc.             | 967.95  |
| Blue H5G               | 207.95         | Gold Orange 3G Pdr. Fine     | 1158.45        | Brown M. Powder Fine           | 768.80  |
| Blue H 5RX             | 286.20         | Brill. Orange 6R Pdr. Fine   | 624.35         | Grey M. Supra Disp.            | 585.45  |
| Blue H 7G              | 213.95         | Gold Orange 3G Supra Disp    | 693.85         | Blue BC Acra Conc. Pdr. Fine   | 762.70  |
| Blue H 7RX             | 358.15         | Brill. Orange 6RX Powder     | 394.30         | Direct Black AC Supra Disp.    | 415.75  |
| Turquoise HA           | 265.05         | Brill. Red 3B Pdr. Fine      | 1214.15        | Direct Black AC Pdr. Fine      | 574.70  |
| Supra Blue H-3RP       | 595.30         | Brill. Red 3B Supra Disp     | 867.45         | Direct Black CH Supra Disp.    | 490.45  |
| Supra Turquoise H 2G P | 181.50         | Brill. Purple 3R Acra Powder | 827.05         | Direct ACD Ptg. Paste          | 217.15  |



Delhi Market

**DELHI: AUGUST 12, (NNS)** A noticeable rise of Rs. 75/80 per kg in menthol prices provided the main feature of trading in the Delhi chemicals market during the week under review, due to fall in supply from U.P. along with heavy mutual speculation between big stockists and speculators for August, Diwali and December delivery transactions, says NNS. Menthol flake medium and bold rose sharply from Rs. 284, Rs. 320 and Rs. 350 to Rs. 365, Rs. 400 and Rs. 425 per kg respectively. Menthol flake August and Diwali delivery were transacted at Rs. 375 and Rs. 395 against Rs. 292 and Rs. 310 per kg. December delivery menthol flake jumped up sharply by Rs. 75 at Rs. 410 per kg.

On reports of about 12/13 wagons of slack wax transacted between some famous stockists, slack wax recorded a sharp rise of Rs. 800 and touched a new high of Rs. 10,000 per tonne. Demand was also good from refineries. As a result of brisk

purchases from Punjab side, paraffin wax resumed higher by Rs. 45 at Rs. 865 per 50 kg. Demand was also good by candle manufacturers for forthcoming festival like Dha-shara and Diwali.

In the face of increase in its prices by manufacturers by Rs. 3 per kg in the local market hexamine rose from Rs. 30.50 to Rs. 33.50 per kg. Borax granular, crystal and boric acid technical flared up by Rs. 10/25 on tight supply. In the absence of fresh import from China chatkolite advanced by Re. 1 at Rs. 63 per kg.

Owing to improved supply, camphor powder suffered a fall of Rs. 4 at Rs. 103 and camphor thal also lost Rs. 2 at Rs. 116 per kg. Titanium dioxide anatase softened by Re. 1 at Rs. 123 in the absence of buying interest. K brand, RC-822 and RCR-2 titanium dioxide ruled quiet at Rs. 108 and Rs. 155 each per kg. Turnover was good over the week. No change was recorded in dyes and colours.

(DELHI MARKET RATES AS ON AUGUST 18, 1989)

|                              |                |                                   |             |
|------------------------------|----------------|-----------------------------------|-------------|
| Ammonia Bicarb (Per 25 Kg.)  | 150.00         | Sodium Bicarbonate (50 Kg.)       | 290/300.00  |
| Mercury (Per flask)          | 11,600.00      | Sodium Hydrosulphite (Per Kg.)    | 34.00/37.00 |
| Soda ash (Per bag)           | 335/355.00     | Rangolite (Per Kg.)               | 63.00/77.00 |
| Ammonium Chloride (50 Kg.)   | 110/180.00     | Boric acid Technical (Per 50 Kg.) | 1,425.00    |
| Caustic soda flakes (50 Kg.) | 590/595.00     | Paraffin Wax (Per 50 Kg.)         | 865.00      |
| Citric acid (Per 50 Kg.)     | 2,160/2,500.00 | Tartaric Acid (Per 50 Kg.)        | 10,750.00   |
| Stable Bleaching Powder      |                | Borax Granular (Per 50 Kg.)       | 710.00      |
| Shriram (Per 25 Kg.)         | 100.00         | Borax Crystal (Per 50 Kg.)        | 715.00      |
| Stable Bleaching Powder KCl  |                | Sodium Nitrite (Per 50 Kg.)       | 700/760.00  |
| (Per 25 Kg.)                 | 95.00          | Sodium Nitrate (Per 50 Kg.)       | 425.00      |
| Stable Bleaching Powder      |                | Camphor Thal (Per Kg.)            | 116.00      |
| Maruti (Per 25 Kg.)          | 90.00          | Camphor Powder (Per Kg.)          | 103.00      |
| Stable Bleaching Powder      |                | Menthol Bold (Per Kg.)            | 425.00      |
| Modi (Per 25 Kg.)            | 98.00          | Menthol Medium (Per Kg.)          | 400.00      |

|                                    |                  |
|------------------------------------|------------------|
| Menthol Flake (Per Kg.)            | 365.00           |
| Glycerine (Per Kg.)                | 55/58.00         |
| Sodium Silicate (Per quintal)      | 250/300.00       |
| Hexamine (Per Kg.)                 | 33.00            |
| Acetic Acid Glacial (Per Kg.)      | 14.00            |
| Copper Sulphate                    |                  |
| (Per quintal)                      | 2,350/2,700.00   |
| Formic Acid (Per Kg.)              | 25.00            |
| Formaldehyde (Per Kg.)             | 8.00             |
| Hydrogen Peroxide (Per Kg.)        | 27.00            |
| Calcium Carbonate                  |                  |
| (Per Tonne)                        | 2,500/4,000.00   |
| Acid Slurry Soft (Per Kg.)         | 24.00            |
| Acid Slurry Hard (Per Kg.)         | 34.00            |
| Phosphoric Acid (Per 50 Kg.)       | 1,050.00         |
| Potassium Nitrate                  |                  |
| (Per quintal)                      | 900/1,200.00     |
| Potassium Permanganate             |                  |
| (Per 50 Kg.)                       | 2,800/3,200.00   |
| Sodium Bichromate                  |                  |
| (Per 50 Kg.)                       | 1,575/1,600.00   |
| Trisodium Phosphate (50 Kg.)       | 500.00           |
| Titanium Dioxide Anatase (Per Kg.) | 123.00           |
| Titanium Dioxide RC-822 (Per Kg.)  | 155.00           |
| Titanium Dioxide K-Brand (Per Kg.) | 108.00           |
| Titanium Dioxide RCR-2 (Per Kg.)   | 155.00           |
| Zinc Oxide                         |                  |
| (Per metric tonne)                 | 42,000/52,000.00 |
| Phenol Carbolic Acid (Per Kg.)     | 37.00            |
| Carbon Tetrachloride (Per Kg.)     | 24.60            |
| Chloroform (Per Kg.)               | 28.00            |
| Sodium Sulphate                    |                  |
| (Per metric tonne)                 | 3,250/3,550.00   |
| Naphthalene Balls (Per 50 Kg.)     | 1,325.00         |

| DYES & COLOURS | (Per Kg)  |
|----------------|-----------|
| Naphthol AS    | 175/201.6 |
| Naphthol ASG   | 180/295.2 |
| Naphthol ASBS  | 210/248.4 |
| Naphthol ASTR  | 265/360.4 |
| Naphthol ASOL  | 210/238.6 |
| Naphthol ASBO  | 195/260.7 |

| DIRECT DYES           | (Per Kg)  |
|-----------------------|-----------|
| Black E. Conc.        | 110/176.9 |
| Diazo Black B.T.      | 105/147.5 |
| Green B               | 90/140.5  |
| Blue 2-B              | 60/101.4  |
| Blue 2-B 225% (JNR)   | 125.00    |
| Sky Blue FB           | 160/235.0 |
| Basic Auramine        | 55/110.0  |
| Basic Rhodamine       | 300/425.0 |
| Basic Methylene Blue  | 100/180.0 |
| Basic Violet          | 150/180.0 |
| Basic Malachite Green | 150/165.0 |
| Acid Orange           | 75/111.2  |
| Congo Red H/C         | 75/120.9  |



# Madras Market

Chemical market was lack lustre during the week. There was a general tendency for the prices to drop due to increased availability and the firmness on the part of the sellers to unload the stock. MEK prices dropped further with reports of fresh arrivals of imported material at lower prices. Similarly Borax prices fell out with increased arrivals mostly from small scale producers. In the case of plastic flakes though the prices remained stable during the week there

was an uneasy calmness as the prices would go down further anytime.

The supply position of products like titanium dioxide, DEG, MIBK, IPA etc. continued to be difficult. Surprisingly, the prices of acetone shot up marginally due to non-arrival of ordered goods. Manufacturers of linear alkyl benzene (LAB) had put up the prices by Rs. 3 per kg and this is yet to have its impact on the acid slurry prices.

|                                        |          |
|----------------------------------------|----------|
| Magnesium Chloride (per kg)            | 3.00     |
| Maleic Anhydride (per kg)              | 40.00    |
| Menthol Crystals (per kg)              | 300.00   |
| Oxalic Acid (per kg)                   | 24.00    |
| Paraffin Wax (per kg)                  | 22.00    |
| Potassium Bichromate (per kg)          | 36.00    |
| Phosphoric Acid (per kg)               | 22.00    |
| Polyvinyl Alcohol powder (per kg)      | 120.00   |
| Pentaerythritol (per kg)               | 52.00    |
| Phthalic Anhydride (per kg)            | 27.00    |
| Soda Ash (TAC) (per 75 kgs)            | 385.00   |
| Soda Ash (TATA) (per 75 kgs)           | 385.00   |
| Sodium Bicarbonate (TATA) (per 50 kgs) | 375.00   |
| Sodium Silicate (per MT)               | 3,500.00 |
| Sodium Bichromate (per kg)             | 28.00    |
| Sodium Nitrate (per kg)                | 8.00     |
| Sodium Nitrite (per kg)                | 15.50    |
| Sodium Sulphide Flakes (per kg)        | 12.00    |
| Sodium Bisulphite (per kg)             | 4.75     |
| Sodium Alginate (per kg)               | 220.00   |
| Sodium Acetate (per kg)                | 7.50     |
| Sodium Sulphate (Anhydrous) (per kg)   | 3.00     |
| Titanium Dioxide (Anatase) (per kg)    | 125.00   |
| Titanium Dioxide (Rutile) (per kg)     | 145.00   |
| Trisodium Phosphate (per kg)           | 12.00    |
| Urea (Technical) (per kg)              | 3.00     |
| Zinc Oxide (per kg)                    | 54.00    |
| Zinc Chloride Powder (per kg)          | 12.50    |
| Zinc Sulphate (per kg)                 | 7.00     |

## SOLVENTS

|                                 |       |
|---------------------------------|-------|
| Acetone -- HOCL (per kg)        | 20.00 |
| Butanol (per kg)                | 35.75 |
| Butyl Acetate (per kg)          | 42.00 |
| Benzene (per lit)               | 17.00 |
| Cellosolve (per kg)             | 50.00 |
| Carbon Tetra Chloride (per kg)  | 22.00 |
| Chloroform (per kg)             | 28.00 |
| Diacetone Alcohol (per kg)      | 29.50 |
| Diethylene Glycol (per kg)      | 48.00 |
| Dichloromethane (per kg)        | 17.00 |
| Di-octyl Phthalate (per kg)     | 49.00 |
| Di-N-butyl Phthalate (per kg)   | 49.00 |
| Ethyl Acetate (per kg)          | 20.00 |
| Isopropyl Alcohol (per kg)      | 30.00 |
| Methanol (per kg)               | 10.00 |
| Methylene Chloride (per kg)     | 22.00 |
| Methyl Ethyl Ketone (per kg)    | 38.00 |
| Methyl Isobutyl Ketone (per kg) | 55.00 |
| Phenol (per kg)                 | 40.00 |
| Sorbitol (per kg)               | 15.00 |
| Triethanolamine (per kg)        | 60.00 |
| Trichloroethylene (per kg)      | 25.00 |
| 1-1-1 Trichloroethane (per kg)  | 27.00 |
| Turpentine (per lit)            | 17.00 |
| Toluene (per lit)               | 22.00 |
| Xylene (per lit)                | 20.00 |

## (MADRAS MARKET RATES AS ON AUGUST 19, 1989)

|                                                  |           |                                           |          |
|--------------------------------------------------|-----------|-------------------------------------------|----------|
| Acetic Acid Glacial (per kg)                     | 16.50     | Calcium Carbonate (Precipitated) (per MT) | 4,750.00 |
| Ammonium Sulphate Iron free (per MT)             | 3,800.00  | Citric Acid (per kg)                      | 48.00    |
| Ammonium Bicarbonate (per 25 kgs)                | 150.00    | Copper Sulphate (per kg)                  | 24.00    |
| Ammonium Chloride (per MT)                       | 3,000.00  | Cresylic Acid 98-99% (per kg)             | 130.00   |
| Acid Slurry (per kg)                             | 30.00     | Pure Para Cresol 96% (per kg)             | 80.00    |
| Ammonium Carbonate (per kg)                      | 6.00      | Meta Para Cresol 42% (per kg)             | 51.00    |
| Ammonium Chloride (per kg)                       | 5.50      | Formic Acid (per kg)                      | 26.00    |
| Acetic Acid Technical (per kg)                   | 24.00     | Formaldehyde (per kg)                     | 8.00     |
| Acid Washing Powder (per 50 kgs)                 | 250.00    | Glue Flakes (per kg)                      | 15.00    |
| Borax (per 50 kgs)                               | 690.00    | Glycerine (per kg)                        | 52.00    |
| Acidic Soda Flakes -- Metturi Chemicals (per MT) | 12,000.00 | Hydrosulphite of Soda (TCPL) (per kg)     | 39.00    |
| Acidic Soda Flakes -- Andhra Sugars (per MT)     | 12,000.00 | Hydrosulphite of Soda (IDI) (per kg)      | 42.00    |
| Calcium Chloride 70% Solid (per MT)              | 2,750.00  | Hydrosulphite of Soda (BASF) (per kg)     | 42.00    |
| Calcium Chloride Anhydrous (per MT)              | 5,500.00  | Hexamine (per kg)                         | 30.00    |
| Calcium Carbonate (Activated) (per MT)           | 5,750.00  | Hyflo Supercell (per kg)                  | 18.00    |
|                                                  |           | Hydrogen Peroxide (per kg)                | 29.00    |
|                                                  |           | Litharge (per kg)                         | 40.00    |
|                                                  |           | Lead Acetate (per kg)                     | 42.00    |
|                                                  |           | Magnesium Carbonate (per kg)              | 19.50    |



# International Bulk Chemical Prices

Spot Prices are as on August 9, 1989

Naphtha prices recovered to \$152-153/ton cif, on the back of stronger crude prices. Ethylene prices continued to recover, being quoted at \$300-315/ton cif NWE. A slight upturn in demand for less available prompt material has moved numbers up. Propylene prices remained stable. Butadiene supplies remained extremely tight, with prices shifting upwards as a reflection of the trend. Prices were being quoted at \$375-385/ton fob NWE. Benzene prices

have firmed up \$300-310/ton fob Rotterdam, marking a sudden upturn in demand for prompt material. Toluene has moved upwards with prices being quoted at \$225-235/ton fob NWE. Increased enquiries for prompt tonnage has pushed numbers up. The continuing upturn in activity surrounding Indian tenders has helped push paraxylene prices up to \$640-645/ton fob Rotterdam. Orthoxylene remained quiet with prices unchanged within the range

DM310-315/ton fob Rotterdam. In a very quiet week, xylenes prices were static at \$300-305/ton for solvent material with virgin at \$305-310/ton. Styrene prices have risen to \$660-670/ton NWE for T1 material, with high numbers believed available. Methanol numbers continue to fall away with material down to \$80-90/ton cif NWE. T2 product is being offered at DM185/ton fob NWE. Oversupply is hitting prices.

| Product                | European Spot price range \$/ton | US price range \$/ton |
|------------------------|----------------------------------|-----------------------|
| Ethylene               | 300-315 (cif)                    | n.a.                  |
| Propylene (100% basis) | 386-412 (cif)                    | 440                   |
| Butadiene              | 375-385 (fob)                    | 396-418 (spot)        |
| Benzene                | 300-310 (fob)                    | 282-285 (spot)        |
| Toluene                | 225-235 (fob)                    | 234-237 (spot)        |
| Xylenes (virgin)       | 305-310 (fob)                    | 262-265 (spot)        |
| (solvent)              | 300-305 (fob)                    | n.a.                  |
| Styrene                | 690-695 (T2)(fob)                | 573-617 (spot)        |
|                        | 660-670 (T1) (cif)               |                       |
| Paraxylene             | 640-645 (fob)                    | n.a.                  |
| Orthoxylene            | 310-315 (fob)                    | n.a.                  |
| Ammonia                | 98-102 (c&f)                     | n.a.                  |
| Methanol               | 92-97 (T2)(fob)                  | 158-160 (fob)         |
|                        | 80-90 (T1)(cif)                  |                       |
| Naphtha                | 152-153 (cif)                    | n.a.                  |

## Shipping News

### VESSELS DUE IN BOMBAY FOR EXPORT LOADING

| Due Date<br>(1) | Steamer's Name & Flag<br>(2) | Agents<br>(3)        | Will load for<br>(4)                                                                                                                                                                                                                                                                                                                                                                                                                                             | Approximate sailing<br>(5) |
|-----------------|------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 27/8            | Medipas Tide                 | Samrat/<br>Hindustan | Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; P. Lauderdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Philadelphia; Halifax; Montreal; Toronto. (Carting at M.O.D. No. 1 for both).                                                                                                                                                                                                                                              | 31/8                       |
| 31/8            | CMB Enterprise               | C.M.B.               | Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans Via Antwerp; Montreal; Toronto; Halifax. (Carting at CFS).                                                                                                                                                                                                                                                                                                         | 2/9                        |
| 2/9             | CMB Plantin<br>(Nhava Sheva) |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4/9                        |
| 25/8            | Uni Pioneer<br>(Voy-012)     | Greenways            | New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Providence; (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Almeida; Redwood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; various inland destinations and Caribbean ports. (Carting at G/H Cotton Depot). | 31/8                       |



| (2)                                             | (3)                                                     | (4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | (5)        |
|-------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Lanka Abhaya<br>Premier                         | Seahorse<br>Killick                                     | New York; Baltimore; Charleston; Norfolk. (Carting at M.O.D. No. 3).<br>S. American Ports. (Carting at 178/180 Cotton Depot)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1/9<br>1/9 |
| Orient Triumph<br>(Cyp)(Voy-312)                | Transworld/<br>OSA                                      | Los Angeles; Longbeach; Sanfrancisco; Oakland; Seattle; Vancouver;<br>New York; Boston; Toronto; Montreal; Philadelphia; Norfolk;<br>Baltimore; Charleston; Savannah; Jacksonville; Miami; New Orleans;<br>Houston. (Carting at M-178/180 Cotton Depot for both).                                                                                                                                                                                                                                                                                                                                                                                     | 2/9        |
| Stonewall Jackson<br>(AME)                      | Samarth                                                 | Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah;<br>New York. (Carting at P/Q-PD).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5/9        |
| Medipas Tide                                    | L. Triest                                               | With T.P. Lagos/Apapa; Abidjan; Dakar; Douala; Cotonou; Nouakchott;<br>Libreville; Tema; Matadi; Conakry; Freetown. (Carting at M-171/173<br>C.D.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 31/8       |
| CMB Enterprise/<br>CMB Plantin<br>(Nhava Sheva) | C.M.B.                                                  | Lagos; Abidjan; Lome; Douala; Matadi; Post Gentil; Pointe Noire;<br>Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema via Antwerp.<br>(Carting at CFS).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2/9<br>4/9 |
| Este Clipper<br>(Voy-806)                       | Arebee                                                  | Lagos/Apapa; P. Harcourt; Abidjan; Tema; Takoradi; Monrovia; Lome;<br>Freetown; Cotonou; Douala; Matadi. (Carting at M-Jetha C.D.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 31/8       |
| Waterkoning                                     | Merzario                                                | Dakar; Abidjan; Monrovia; Lome; Douala; P. Noire; Matadi; Libreville;<br>Cotonou; P. Gentil; Lagos; P. Harcourt; Warri; Freetown; Conakry;<br>Louanda; Nouakchott; Guinea; Blassa. (Carting at M.O.D. No. 2).                                                                                                                                                                                                                                                                                                                                                                                                                                         | 31/8       |
| Orient Triumph<br>(V-312)                       | Transworld                                              | Monrovia; Lome; Lagos; Douala; Tema; Takordi; Abidjan; San Pedro.<br>(Carting at M-178/180 Cotton Depot).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2/9        |
| Pazin (Yuf)                                     | Oceanic                                                 | Jeddah; Rijeka                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2/9        |
| Drvar (Yug)                                     | Oceanic                                                 | P. Said; Rijeka                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2/9        |
| Integra                                         | Tata Tea                                                | Assab; Djibouti; P. Sudan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10/9       |
| Medipas Tide                                    | L. Triest/<br><br>Samrat/<br>Hindustan/<br><br>Merzario | Jeddah; Barcelona; Marseilles; Genoa; Leghorn; La Spezia; Naples;<br>with TP. Trieste; Venice; Ravennah; Bari; Koper; Rijeka;<br>Las Palmas; Santacruz De Teneriffe; Malta; Limmassol; Alexandria;<br>Casablanca; Tunis; Algiers; Lattakia; Tripoli; Benghazi; Oran;<br>Point E Pitre; Port De France. (Carting at M-171/173 Cotton Depot).<br>Barcelona; Marseilles; La Spezia; Livorna; (Leghorn); Genoa; Naples<br>and other Italian ports and FCL only Beirut; Alexandria; Valletta;<br>Lattakia; Mersin. (Carting at M.O.D. No. 1 for both).<br>Genoa; Leghorn; La Spezia; Naples; Salerno; Marseilles; Barcelona.<br>(Carting at M.O.D. No. 2). | 31/8       |
| CMB Enterprise/<br>CMB Plantin<br>(Nhava Sheva) | C.M.B.                                                  | Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona;<br>Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin;<br>Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham;<br>Avonmouth; Dublin and all inland destinations in U.K.; Antwerp;<br>Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo;<br>Gothenburg; Stockholm; Malmao; Aarhus; Helsinki. (Carting at CFS).                                                                                                                                                                                                                           | 2/9<br>4/9 |
| Uni Pioneer<br>(V-012)(Pan)                     | Greenways                                               | Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London;<br>Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly;<br>Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen;<br>Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all<br>destinations in U.K.; Germany; Switzerland and Austria. (Carting at<br>G/H Cotton Depot).                                                                                                                                                                                                                                                                                               | 31/8       |
| Waterkoning<br>(Dut)                            | Samrat/<br>Hindustan/<br>Merzario                       | Felixstowe; Hamburg; Rotterdam; Also London; Liverpool; Leixoes;<br>Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leicester;<br>Le Havre; Amsterdam; Bremen; Antwerp; Copenhagen; Leeds;<br>Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast and all<br>destinations in U.K., Benelux Germany, Italy; France; Switzerland<br>and Austria. (Carting at M.O.D. No. 2 for Merzario) (Carting at<br>M.O.D. No. 1 for Samrat and Hindustan).                                                                                                                                                                                                    | 31/8       |
| Navigare (V-708)                                | Killick                                                 | Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds;<br>Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam;<br>Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia;<br>Marseilles; Barcelona. (Carting at M-178/180 Cotton Depot).                                                                                                                                                                                                                                                                                                                                                                                  | 3/9        |
| Lanka Abhaya<br>(Ger)                           | Seahorse                                                | Hodeidah; Jeddah; Aqaba; Alexandria (Direct); Felixstowe; London;<br>Liverpool; Manchester; Avonmouth; Dublin; Glasgow; Wembly;<br>Leicester; Immingham; Birmingham; Leeds; Antwerp; Bremen;<br>Copenhagen; Gothenburg; Hamburg; Rotterdam; Oslo; Stockholm;<br>Helsinki; Aarhus; Malmao; Norkopping. (Carting at M.O.D. No. 3).                                                                                                                                                                                                                                                                                                                      | 1/9        |



| (1)    | (2)                              | (3)                                 | (4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (5)  |
|--------|----------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 30/8   | Orient Triumph<br>(Cyp)(Voy-312) | Transworld                          | Djibouti; Hodeidah; Alexandria; Benghazi; Tripoli; Malta; La Spezia; Mersin; Naples; Limasol; Piraeus; Genoa; Leghorn; Fos; Valencia; and all inland destinations; Jeddah; P. Sudan; Assab; Massawaa. (Carting at M-178/180 Cotton Depot).                                                                                                                                                                                                                                                                                   | 2/9  |
| 4/9    | Stonewell Jackson                | Samarth                             | Aqaba; Assab; (Alexandria). (Carting at P/Q-PD).                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5/9  |
| 27/8   | Medipas Tide                     | L. Triest                           | Colombo. (Carting at M-171/173 Cotton Depot).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 31/8 |
| 28/8   | Lanka Abhaya                     | Seahorse                            | Colombo. (Carting at M.O.D. No.3).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1/9  |
| 2/9    | Tulsidas                         | S.C.I.                              | Chittagong                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 4/9  |
| 25/8   | Uni Pioneer<br>(V-012)(Pan)      | Greenways                           | Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Pusan; Hongkong. (Carting at G/H Cotton Depot).                                                                                                                                                                                                                                                                                                                                 | 31/8 |
| 28/8   | Premier                          | Killick/T.Tea/<br>I.M.E.            | Singapore. (Carting at M-178/180 Cotton Depot for Killick) (Carting at T.P No. 4 for Tata Tea) (Carting at Wadi Bunder No. 3 for I.M.E.).                                                                                                                                                                                                                                                                                                                                                                                    | 1/9  |
| 28/8   | Lanka Abhaya                     | Seahorse                            | Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama and FCL only Busan; Inchon; Osaka; Tokyo; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).                                                                                                                                                                                                                                                                                                                                                             | 1/9  |
| 2/9    | Tulsidas<br>(Nhava Sheva)        | S.C.I.                              | Singapore and other Far East Ports.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4/9  |
| 4/9    | Stonewall Jackson                | Samarth                             | Singapore. (Carting at P/Q-PD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5/9  |
| 28/8   | Premier<br>(V-02) (Phi)          | I.M.E./<br><br>Killick/<br>Tata Tea | Sydney; Melbourne; Adelaide; Freemantle; Brisbane; Auckland; Wellington; Lyttelton. (Carting at Wadi Bunder No. 3 for IME).<br>Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon P; Launceston; Burnie; P. Chalmers; Lyttelton; Christchurch; Dunedin; New Plymouth; Auckland; Wellington; Napier also western Samoa; Papua; New Guinea; Solomon Island; American Samoa; Tonga; New Caledonia; Rabaul; P. Villa. (Carting at M-178/180 Cotton Depot for Killick) (Carting at Timber Pond No. 4 for T. Tea). | 1/9  |
| 28/8   | Lanka Abhaya                     | Seahorse                            | Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Carting at M.O.D. No. 3).                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1/9  |
| 2/9    | Tulsidas                         | S.C.I.                              | Melbourne; Fremantle; Adelaide; Sydney.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4/9  |
| 31/8   | CMB Enterprise                   | C.M.B.                              | Dubai; Abu Dhabi; Bahrain; Kuwait; Dammam; Doha. (Crtg. at CFS).                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2/9  |
| 24/8   | Sunset (UAE)                     | Worldlink                           | Dubai                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 31/8 |
| 28/8   | Lanka Abhaya                     | Seahorse                            | Dubai; Khorfakkan; Sharjah; Muscat; Dammam; Riyadh; Kuwait. (Carting at M.O.D. No. 3).                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1/9  |
| 30/8   | Orient Triumph<br>(V-312)(Cyp)   | Transworld                          | Sharjah; Dubai; Abu Dhabi; Ajman; Doha; Kuwait; Dammam; Baghdad; Basrah; Syria and inland destinations in Gulf. (Carting at M-178/180 Cotton Depot)                                                                                                                                                                                                                                                                                                                                                                          | 2/9  |
| Stream | Vishva Nandini<br>(Ind)          | S.C.I.                              | Seychelles; P. Louis; Tamatave; Mombasa; Dar Es Salaam; Beira and inland destinations in E. Africa. (Carting at Timber Pond No. 1).                                                                                                                                                                                                                                                                                                                                                                                          | 31/8 |
| 6/9    | Integra (V-II)                   | Arebee/<br><br>Tata Tea             | Dar Es Salaam & Mombasa (Direct); Kampala; Jinja; Tororo; Lugazi; Entebbe (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Zanzibar.<br>Mombasa; Dar Es Salaam (Direct); Beira; Mahe and inland destinations in East Africa                                                                                                                                                                                                                                                    | 10/9 |
| 26/8   | Este Clipper<br>(V-806)          | Arebee                              | Loading Ports same as Integra. (Carting at M-Jetha, Cotton Depot).                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 31/8 |
| 2/9    | CMB Plantin<br>(Nhava Sheva)     | C.M.B.                              | Dar Es Salaam; Mombasa (Direct); Nacala; Tanga; Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in East Africa. (Carting at CFS).                                                                                                                                                                                                                                                                                                                                                            | 4/9  |

## VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

| Due Date | Steamer's Name    | Agents     | From        |
|----------|-------------------|------------|-------------|
| 30/8     | Shazli            | Intermodal | Turkey      |
| 5/9      | Sulu Express      | S.C.I.     | U.K. Cont.  |
| 4/9      | Stonewall Jackson | Samarth    | U.S.A.      |
| 30/8     | Vishwa Nayak      | S.C.I.     | Const./Ily. |



## Materials Imported

### PLASTIC MATERIALS IMPORTED BOMBAY (From 1.5.89 to 3.5.89)

**ACRYLAMIDE:** From Japan: L.N. Chemical Inds., 2,000 Kgs., Rs. 47,208; Arvivan Industries, 5 MTs., Rs. 1,18,021; PDI Chemicals Ltd., 2,000 Kgs., Rs. 1,94,498; Shree Vinayak Inds., 5,000 Kgs., Rs. 1,18,020.

**CAPROLACTAM:** From Belgium: Parware Nylon Ltd., 1,24,250 Kgs., Rs. 37,93,094; Jagatjit Cotton Textile Mills Ltd., 1,24,250 Kgs., Rs. 37,93,094; Nirlon Synthetic Fibres Chem. Ltd., 4,44,000 Kgs., Rs. 1,35,54,396; From Netherlands: Jagatjit Cotton Text. Mills Ltd., 55,000 Kgs., Rs. 75,83,986.

**EPOXY RESIN & HARDENERS:** From Taiwan: Ceramic Components, 100 Kgs., Rs. 28,030.

**HDPE:** From Japan: Jajudia Inds. Ltd., 25 MTs., Rs. 4,44,673; From Saudi Arabia: Pearl Plastic Inds., 11.5 MTs., Rs. 3,02,258; Progressive Trading Co., 51,450 Kgs., Rs. 7,81,522; The Supreme Inds. Ltd., 199.95 MTs., Rs. 31,48,876; From Yugoslavia: Grauer Trading Co., 35,000 Kgs., Rs. 5,80,398; Mehta Traders, 50 MTs., Rs. 8,04,980.

**LDPE:** From Qatar: Hitkari Potteries Ltd., 16.5 MTs., Rs. 3,06,381; From Turkey: Indian Petrochemicals Corpn. Ltd., 2,000 MTs., Rs. 3,72,44,971; From Yugoslavia: Hind Polymers, 200 MTs., Rs. 34,26,442.

**PTFE:** From Japan: Space Application Cables, 1,000 Kgs., Rs. 1,85,685.

**PVC RESIN:** From France: Inarco Ltd., 14 Kgs., Rs. 2,81,752; From FRG: Indian Cork Mills Ltd., 6,000 Kgs., Rs. 1,24,652; From FRG: U.P. Asbestos Ltd., 50 MTs., Rs. 13,93,418; From Korea: Cable Corporation of India Ltd., 200 MTs., Rs. 31,64,146; Oswal Cable Products, 72,000 Kgs., Rs. 14,78,754; From Romania: Kalpana Plastics, 250 MTs., Rs. 32,91,935; Raj Pipes Pvt. Ltd., 200 MTs., Rs. 26,29,759; Uniplas India Ltd., 200 MTs., Rs. 26,34,270; From Taiwan: Northern India Leather Mfg. Co. Pvt. Ltd., 105 MTs., Rs. 21,14,407; From Turkey: Asian Chem, 80,000 Kgs., Rs. 15,19,486; From Yugoslavia: Ajanta Tubes Ltd., 500 MTs., Rs. 68,45,178.

**POLYACETAL RESIN:** From Japan: Jamna Das Murlidhar Jaisingh, 17,000 Kgs., Rs. 5,61,777; Vishal Plastics Pvt. Ltd., 17 MTs., Rs. 5,61,774.

**POLYBUTENE:** From Japan: Savita Chemicals Ltd., 12,240 Kgs., Rs. 1,44,457.

**POLYCARBONATE MOULDING POWDER:** From Netherlands: Peico Electronics & Electrical, 5,000 Kgs., Rs. 4,89,139.

**POLYCARBONATE SYNTHETIC RESIN:** From Australia: Shah Polymers, 15,000 Kgs., Rs. 8,32,437.

**POLYETHYLENE GRANULES:** From Belgium: Vindhya Telelinks Ltd., 5,850 MTs., Rs. 4,01,776.

**POLYETHYLENE WAX (EMULSIFIABLE):** From Japan: Dye Auxy, 5 MTs., Rs. 1,18,020.

**POLYPROPYLENE:** From Belgium: Peico Electronics & Electricals Ltd., 1,000 Kgs., Rs. 65,642; From FRG: Lustre Polymers, 14,000 Kgs., Rs. 2,40,323; From USA: Plastica, 15 MTs., Rs. 2,50,203; Plasto Trades, 15 MTs., Rs. 2,59,645; From Yugoslavia: Bhareesh Overseas Corpn., 31 MTs., Rs. 4,73,974; Ravi International, 77.5 MTs., Rs. 11,55,635.

**POLYSTYRENE:** From Japan: Pre-mchem Gums Pvt. Ltd., 17 MTs., Rs. 3,89,894.

**SYNTHETIC RESIN:** From UK: Mars Plastic, 38,530 Kgs., Rs. 2,42,523; From USA: Gujarat Plastic Inds., 18,492 Kgs., Rs. 1,16,383; Indian Aluminium Co. Ltd., 16,000 Kgs., Rs. 5,28,731; Parle Products Pvt. Ltd., 3,402 Kgs., Rs. 1,13,492.

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ANTIMONY OXIDE: From Japan:

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BIOCHEMICALS: From USA: Central Leather Research, 34 Nos., Rs. 14,599; Christian Medical College, 5 Lbs., Rs. 6,160; Madurai Kamaraj University, 15 Lbs., Rs. 6,806; National Institute of Nutrition, 10 Lbs., Rs. 27,923.

CAPROLACTAM: From Belgium: SRF 3,90,500 Kgs., Rs. 1,23,77,928.

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HYDRAZINE HYDRATE: From USA: Inventaa Chemicals Pvt. Ltd., 15,200 Kgs., Rs. 4,46,303.

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HYDROXY PROPYLCELLULOSE: From Japan: Tablets (India) Ltd., 10 Kgs., Rs. 5,973.

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ISOBUTYL BENZENE PURE: From USA: Cheminor Drugs Pvt. Ltd., 68,285 Kgs., Rs. 37,02,389.

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**POLYPROPYLENE:** From Italy: Kunal Engineering Co. Ltd., 15 MTs., Rs. 2,70,264; From Singapore: Integrated Exports, 30,000 Kgs., Rs. 4,00,392; Narasimha Plastics Indl. Ltd., 16,000 Kgs., Rs. 2,68,419; Rabbani Exports, 32 MTs., Rs. 4,51,810.

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**PROPYLENE GLYCOL:** From FRG: Bush Boake Allen India Ltd., 52,896 Kgs., Rs. 10,78,354.

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**SODIUM HYDROSULPHITE:** Felixstowe: Tamil Nadu Chemical Products Limited, 16.8 Kgs., Rs. 2,85,42

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**ERYTHROMYCIN:** To Bangkok: Pradeep Drug Company, 50 Kgs., Rs. 43,750.

**ERYTHROMYCIN ESTOLATE:** To Copenhagen: Pradeep Drug Co., 10 Kgs., Rs. 97,000.

**ERYTHROMYCIN STEARATE:** To Bangkok: Pradeep Drug Co., 45 Kgs., Rs. 3,93,500.

**IBUPROFEN BP 80:** To Singapore: Shasun Drugs Ltd., 1,000 Kgs., Rs. 2,31,238.

**IBUPROFEN USP:** To New York: Cheminor Drugs Pvt. Ltd., 10,000 Kgs., Rs. 26,05,922.

**IBUPROFEN USSP & BP 80:** To New York: Cheminor Drugs Private Limited, 10,000 Kgs., Rs. 24,53,646.

**ISONIAZID BP 80:** To Hong Kong: Veer Chemie Aromatics Private Limited, 2,000 Kgs., Rs. 2,81,200.

**MEBENDAZOLE USP:** To Bangkok: Pradeep Drug Co., 150 Kgs., Rs. 71,700.

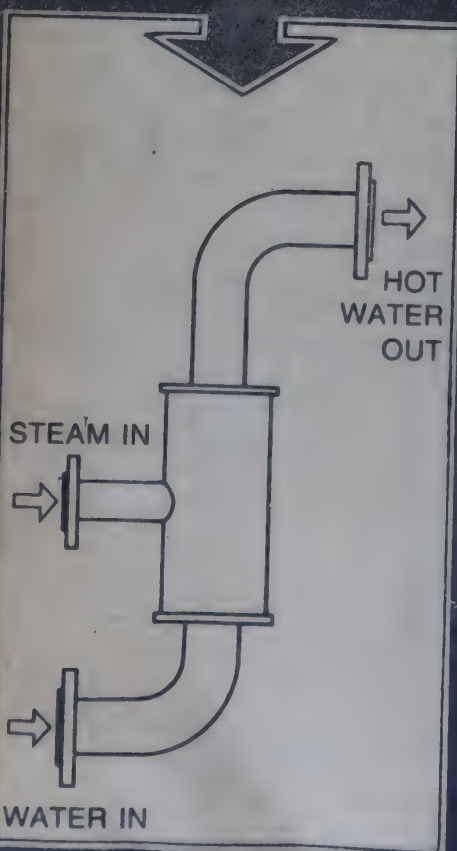
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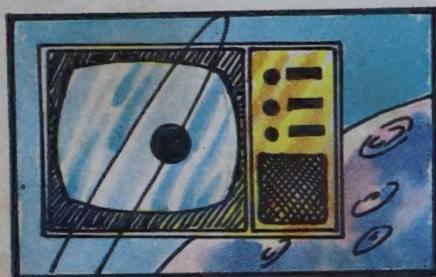
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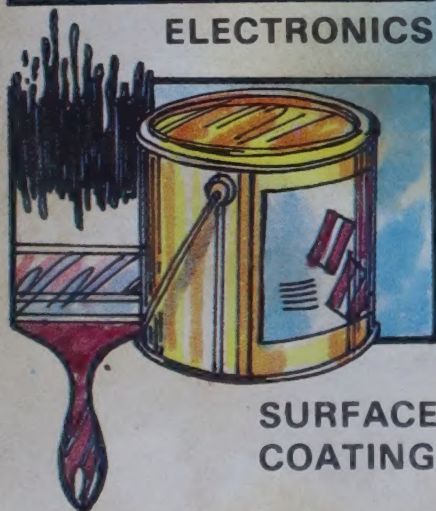




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